EFFECTS OF REPETITION ON

PHONATION THRESHOLD PRESSURE TASK PERFORMANCE

by

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Purpose: Phonation threshold pressure (PTP) is a widely used measure to evaluate vocal fold structure and function. Although concerns have been expressed about PTP's vulnerability to shifts as a function of practice, to date no study has addressed this question systematically. The present study addresses that gap at a preliminary, exploratory level.

Methods: Nineteen vocally healthy women between 19-27 yrs were recruited into the study. Participants were screened for normal vocal function and self-reported normal learning abilities. Each participant performed a standard PTP task at her 80%ile pitch across 5 practice blocks on two consecutive study days under the same experimental conditions.

Results: All participants improved both PTP and PTP standard deviation (SD) values from first to best block in the study, without any specific interventions. Statistical analyses confirmed participants as a group improved in average PTP performance from first to best block within and across experimental days. Individual data showed changes ranged from 0.67 – 5.42 cm H20 (mean = 2.42 cm H20). Improvements in SDs were also significant, ranging from 0.28-2.39 cm H20 improvement shown by individual data.

Conclusions: The data suggest caution is warranted in the interpretation of PTP changes subsequent to research and clinical interventions, and provide initial estimates of changes that may occur with task repetition alone. Results from the present study provide motivation for further systematic work on repetition effects on PTP performance.

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1.0 INTRODUCTION

Phonation threshold pressure (PTP)*,* the minimum amount of subglottal pressure required to initiate and sustain vocal fold vibration, has been widely used as an indirect indicator of vocal fold state and function along a variety of dimensions. Theoretically, PTP has been linked to a series of vocal fold parameters including tissue viscosity, vocal fold thickness, speed of the mucosal wave through the tissue, and pre-phonatory glottal width (Titze, 1988) as well as vocal tract inertance (Chan & Titze, 2006). In research, a particular focus has been changes in PTP as a possible reflection of vocal fold viscosity variations due to warm-up and hydration effects (Fisher, Ligon, Sobecks, & Roxe, 2001; Milbrath & Solomon, 2003; Motel, Fisher, & Leydon, 2003; Roy, Tanner, Gray, Blomgren, & Fisher, 2003; Sivasankar, Erickson, Schneider, & Hawes, 2008; Sivasankar & Fisher, 2002; Solomon & DiMattia, 2000; Verdolini, et al., 2002; Verdolini, Titze, & Fennell, 1994; Verdolini-Marston, Sandage, & Titze, 1994).

In most settings, PTP is estimated non-invasively from oral pressures during a consonant-vowel repetition task (Holmberg, Hillman, & Perkell, 1988; Smitheran & Hixon, 1981). Participants produce a string of voiceless stop consonants alternating with vowels, at a constant effort level. Phonatory subglottal pressure is then estimated from peak intraoral pressures during adjacent stop consonants. The suggestion is that when intraoral pressure peaks during those consonants, it reflects subglottal pressure because the vocal folds are abducted, thus allowing for equalization of pressures above and below the folds. A further assumption is that in steady-state utterances,

intraoral pressures during voiceless consonants are the same or similar to pressures during interposed phonated vowels (R. J. Baken & R. F. Orlikoff, 2000; Verdolini-Marston, Titze, & Druker, 1990).

Studies have been reported on methodological issues shown to influence both the validity and reliability of PTP measures. Examples include speed of syllable productions as well the "smooth" versus "ballistic" nature of syllable production (Holmberg, et al., 1988). However, a lingering concern has regarded shifts in PTP values across time, independent of any change in vocal health or interventions. In particular, it seems likely that PTP, as many measures, is influenced by practice effects including warm-up, learning and fatigue. Although several authors have implied concern about such issues by attempting to minimize at least learning effects in the data (for example (Chang & Karnell, 2004; Milbrath & Solomon, 2003; Motel, et al., 2003; Sivasankar, et al., 2008; Sivasankar & Fisher, 2002; Tanner, Roy, Merrill, & Elstad, 2007), to date, no studies have addressed learning or other practice effects systematically, nor has any study systematically documented the number of trials needed to saturate learning for the PTP task.

The present study addressed these gaps at a preliminary level by exploring possible changes in PTP values as a function of PTP task repetition, without any interposed interventions or likely changes in vocal fold health. Specifically, the study assessed changes in PTP values during an initial training day and at 24-hr follow-up which, according to most accepted definitions, would reflect longer-term learning (Schmidt & Lee, 2005).

The study used a non-experimental design, i.e. without any difference in manipulations within or across subject groups, to ask the following questions: (1) Is any preliminary evidence shown for systematic warm-up, learning or fatigue effects in PTP averages and standard

deviations, within or across participants, as a function of PTP task repetition up to a 24-hr retention interval? (2) What is the *amount* of change in average and standard deviation of PTP that might be expected as a function of task repetition? and (3) Does any evidence emerge about the average number of repetitions needed to saturate learning for the PTP task while at the same time protecting from fatigue effects? and (3) Preliminary answers to the questions can help inform future experimental studies around these issues and hopefully eventually influence the design of studies that assess PTP changes with various interventions or changes in vocal fold health.

A final introductory note is that this initial study was conducted with vocally healthy participants. The assumption is that most individuals with voice problems –the majority of whom are cognitively and motorically intact -- will produce quantitatively but not qualitatively different results. This assumption can be pursued in later studies as appropriate.

2.0 METHODS

Participants

Nineteen women between the ages of 19-27 years participated in the study (average age = 21 yr). The rationale for restricting gender and age was that these factors might introduce variability in the data, and females are at particular risk for voice disorders (Best & Fakhry, 2011; Roy, et al., 2004). Thus, the study of this subject group has particular clinical meaning. Most participants were university undergraduate students recruited from classes in a School of Rehabilitation, specifically from departments of Physical Therapy, Occupational Therapy, Rehabilitation Science, Emergency Medicine, Physician Assistant, Sports Medicine and Nutrition departments, and Health and Information Management. None of the participants were students or professionals in Communication Science or Disorders and therefore none had formal background information about PTP. By their report, no participants had prior experience with vocal performance except one participant who had sung in a high school choir. All participants were generally healthy by their report and attended two study sessions exactly 24 hours apart. The 24-hr interval is relevant as a retention interval because it holds constant time of day, which arguably could affect performance (see for example)(van Mersbergen, Verdolini, & Titze, 1999).

Inclusion criteria were (a) no previous history of a voice change lasting more than two weeks, by subject report; (b) normal voice on the day of the experiment, as determined by two independent licensed, voice-specialized speech-language pathologists ($\geq$ 5 yr experience), based

on the subject's conversational speech either live or recorded; (c) naïve to the experimental hypotheses; (d) no prior experience with any formal measures of voice; (e) no medication use other than birth control medications (f) normal responses on evaluations of motor and cognitive function, to meet the expectation of normal learning abilities. Motor abilities were assessed through performance on a laryngeal diadokokinetic task, comparing results to norms (Ptacek, Sander, Maloney, & Jackson, 1966). Any subject who performed less than 1 standard deviation below the normed number of glottal stops per second, using a standardized protocol (Ptacek et al., 1966), would be excluded from further participation. It turned out that no individuals were excluded for this reason. A questionnaire designed to elicit information about participants' learning abilities was administered to assess gross cognitive function (Appendix A). This questionnaire was devised for the purposes of the present study, and inquired about factors that intuitively might indicate poor motor learning abilities. Any subject indicating a history of generally poor motor performance or learning, compared to peers, would not be further included in the study. Again, it turned out that no individuals were excluded because of this factor. Excluding participants for other factors such as smoking and menstrual cycle was considered. However the primary aim of the study was to examine practice effects, not to establish normative phonation threshold pressure values. Assuming extraneous factors such as smoking and menstrual cycle are generally constant across a 24-hour time period, PTP changes observed across that time frame should be due to practice effects rather than any of these other factors. Finally, (g) although formal tests of hearing were not conducted, there were no indicators for any participant that the participant might have a hearing loss, which arguably could affect their ability to understand or perform the PTP task validly. Specifically, all participants produced PTP consistently within the range of what the experimenter and participant both considered were at or

near phonation threshold. All participants were naïve to the experimental hypotheses and remained naïve throughout the experiment

Instrumentation

Oral pressure and flow signals were collected during a repeated consonant-vowel (CV) task, using the Phonatory Aerodynamic System (PAS), model 6600 (KayPENTAX). In that system, oral pressures estimating subglottal pressures are obtained through a disposable catheter, which is connected to a pressure transducer. Inherent to that that system, oral pressure tubes are oriented straight into the participant's mouth as opposed to at a 90◦ angle as recommended by Baken and Orlikoff (R. Baken & R. F. Orlikoff, 2000). Flow and pressure signals were calibrated prior to each day's data collection. Participants' vocal ranges were elicited using a Casio electronic keyboard (model CA-100). Rhythm for PTP production rate was guided using a Wittner metronome (model Taktell, Piccolo) set at 92 beats per minute. Recordings of participant voices were made using a Radio Shack free-standing microphone connected to QuickTime Player for Macintosh Version 7.6.6.

Experimental Protocol

A single subject group was utilized to obtain information about possible effects of repetition for the PTP task. Nineteen participants produced PTP on two separate days. Participant number was not based on any particular calculation, as previous experiments have not provided sufficient data for power analysis.

As an overview, on Day 1, participants performed the PTP task for 5 blocks of trials. Each block consisted of 5 repetitions of a /pi pi pi pi pi/ string, and thus 25 /pi/ syllables per block (125 syllable productions per day). This number of trial sets was chosen because it is generally consistent with learning saturation attempts used in previous studies (e.g.,) (Milbrath &

Solomon, 2003; Sivasankar, et al., 2008; Sivasankar & Fisher, 2002). Participants returned 24 hours later for retention testing and performed the identical tasks, under the exact same conditions and number of repetitions as Day 1.

In greater detail, on Day 1, the participant and examiner first determined the participant's vocal range, using previously described procedures (Verdolini, et al., 1994). Starting at a comfortable pitch, participants produced /a/ and proceeded to progressively higher pitches in the diatonic scale as prompted by the examiner using an electronic keyboard. The examiner coached and encouraged the participant until both examiner and subject were convinced the highest possible tone had been produced. Although register was not monitored formally, all participants produced their highest tone in what the examiner – a trained vocalist – considered head voice or falsetto (Hollien, 1974). This procedure was repeated three times. Then, the participant phonated on /a/ at a comfortable pitch, and descended diatonically to the lowest possible pitch possible, again as coached by the examiner with the use of the keyboard. Also these trials were repeated three times. Thus, three separate estimates of highest and lowest notes were obtained. The highest and lowest pitches across all trials were used to determine the subject's semitone pitch range.

The 80^{th} percentile pitch in each participant's range was used for that individual for all PTP trials in the experiment. Across participants, the 80^{th} percentile pitch ranged from 523 (C5) – 739 (F#5) Hz (Table 1). The 80^{th} percentile pitch was selected due to its reported vulnerability to fluctuations in PTP as well as its sensitivity to PTP effects (Solomon, Ramanathan, & Makashay, 2007; Verdolini, et al., 2002; Verdolini, et al., 1994; Verdolini-Marston, et al., 1994; Verdolini-Marston, et al., 1990). Generally, PTP tasks are more difficult (effortful) and variable at high as compared to conversational or low pitches (Verdolini-Marston, et al., 1990). Thus, the

use of a high pitch in the present study would reduce the likelihood of floor effects in which participants succeeded in producing their lowest possible PTP on the first trial, precluding the ability to assess practice effects. Moreover, as noted, the 80th percentile pitch has been shown to be more sensitive to various conditions and interventions than comfortable or low pitches (Verdolini, Druker, Palmer, & Samawi, 1998; Verdolini-Marston, et al., 1990). Thus, the use of this pitch would have external validity with respect to future investigations.

Insert Table 1 about here

Next, participants received instructions about how to perform the PTP task, following a protocol described by Verdolini et al. (Verdolini, et al., 2002). Pre-recorded instructions, made by the examiner, instructed participants to "say /pi pi pi pi pi/ as smoothly and softly as possible, at the pitch given, without whispering." The examiner produced the /pi pi pi pi pi/ syllables in the recording at C5, as quietly as she could. Pre-recorded instructions were used to ensure uniformity across participants. Production rate was approximately 1.53 syllables per second indicated by a metronome set at 92 beats per second (Holmberg, et al., 1988). After they received recorded instructions, participants were also encouraged verbally to think of the task as involving a prolonged /i/ sound with /p/ inserted within it (after production of the first /pi/), as recommended by Holmberg et al., (1984). To enhance the likelihood that participants would truly aim for threshold productions, recorded instructions were played again before production of each string of /pi/ syllables. Before each string, the examiner also provided the target pitch using a keyboard, and further modeled the task vocally at the participant's specific pitch, as quietly as possible. For each utterance, the investigator verified the impression that threshold productions

were achieved. For example, phonation failure for some portions of vowel productions, as heard and seen by the aerodynamic trace on the computer screen, would be evidence the subject's productions generally hovered around threshold. Phonation failure occurred rarely (< 5% of trials). If phonation failure did occur, the utterance was not repeated to replace it, as that manipulation would have changed the number of total task repetitions in the study, which was be held constant. Syllables without phonation were excluded from data analysis. Achievement of target pitch was verified aurally by the examiner, a trained vocalist, for each syllable produced. All participants, with the exception of one, achieved the target pitch for all syllables well within 1 semitone of accuracy. The outlying participant consistently produced her syllable strings about one whole tone below target, for all productions in the study. Again, as for pressure signals, if the target pitch was not achieved, the string was not repeated. However, inaccurate tokens produced by the single participant noted were retained in analysis, because her degree of inaccuracy was roughly consistent across trials.

As noted, each subject produced five repetitions of the /pi pi pi pi pi/ utterance to constitute a block of utterances. Participants produced five blocks of these utterances each experimental day (blocks 1-5 on Day 1 and blocks 6-10 on Day 2, which started exactly 24 hr after the start on Day 1), under identical conditions. Participants received a uniform rest between trial blocks, as inter-trial interval time is known to affect learning at least in the limb motor learning literature (Dees & Grindley, 1951; McGuigan, 1959; Salmoni, Schmidt, & Walter, 1984). Specifically, after the production of each block, participants rested for two minutes before initiating the next block of productions, which began with the recorded instructions and a pitch cue on the keyboard as well as examiner model.

After the production of the first 5 blocks on Day 1, participants were excused and sent home with instructions to avoid heavy voice use and to continue with their normal dietary habits and exposures until presentation at the clinic the next day. Each participant was required to keep a journal to document her adherence to the guidelines, and return the journal on the second study day. Specifically, participants were instructed to avoid alcohol use, excessive talking or yelling, any medications other than birth control, illicit drugs, and sleep deprivation. All participants reported adherence to these parameters in their journal. The veracity of the journal reports, which arguably may be suspect, was considered less important than the use of a journal itself, which according to some data, should enhance the likelihood that participants will comply with clinical instructions (Finkelstein, O'Connor, & Friedmann, 2001).

Data Analysis

Subglottal pressure for peaks 2, 3, and 4 in each /pi pi pi pi pi/ string were manually estimated from intraoral pressures displayed on the PAS screen for each /p/ in the string. Pressures from the middle three /p/ productions were averaged for each string and used in data analysis. Automated PAS analyses were not used because of the potential for automation error, as clearly seen in preliminary exploration. It should be noted that the manual procedure used, which estimated subglottal pressure during voiceless stop production rather than phonation, was an inadvertent deviation from standard approaches that estimate *phonation* pressures during vowels in the series as an average of pressures during adjoining consonants (e.g., Holmberg, 1988). Despite this procedural anomaly that will be corrected in a subsequent version of this paper, results are not expected to vary substantially from those obtained in the standard fashion (Douglas Roth, personal communication, February 27, 2011). Pressure values corresponding to non-zero values in the simultaneous flow signal were not included in analysis to avoid

underestimation of pressure (Holmberg, et al., 1988). Such values were treated as missing data, and were interpolated by calculating the average of the two valid data points before and after the missing data point.

PTP and PTP standard deviation (SD) data were examined for the group as a whole and for individual participants. Regarding PTP, For group data, first, average oral pressures were calculated for each participant, for each /pi pi pi pi pi/ string and from those values, for each trial block. Average PTP values across participants were then used to examine numeric changes in PTP across trial blocks as well as the shape of PTP curves across blocks. Of particular interest was the extent to which curves might reflect a logarithmic function, which has been reported to characterize motor learning in other studies (e.g., Crossman, 1959). Also using group data, *t*-tests were conducted to assess the reliability of potential improvements from baseline (block 1) PTP to subsequent PTP performance blocks in both days of the study, and from the first block each day to the best block each day. Individual data were examined descriptively to determine the number of participants who showed improvements in PTP from first block to best block across the study, to determine individual amounts of improvement, and improvement pattern. In that analysis, a particular question was whether there might be any aspect of the data that might point to the number of trials generally needed to saturate learning, without invoking fatigue effects. PTP SDs were examined in a similar fashion, as some observations have suggested stability in PTP may also be a critical factor for interpretation of PTP data (e.g. Verdolini et al., 1990).

For inferential tests, the investigation-wide alpha level was set at .05. To correct for potential alpha inflation across the 6 hypotheses tested, the alpha level for each hypothesis was set at .008 (.05/6 tests).

3.0 RESULTS

PTP data

Group data. Average PTP data across all participants revealed clear evidence of learning from the first to the last trial block. Data are shown in Table 2. This Table indicates that average group PTP was 9.71 cm H20 for the first block on Day 1, and more or less progressively improved to a minimum of 8.00 cm H20 for the last block on Day 2. These values are in the general range of values reported by other authors for PTP at the 80th percentile (see, for example) (Verdolini, et al., 1994), although in the present data set, progressive improvement over trials is shown by the group data.

Insert Table 2 about here

Figures 1a-c display the data graphically, for both Day 1 and Day 2 combined (Figure 1a), and for Day 1 and Day 2 separately (Figures 1b and 1c). (Note that minimum PTP values are not zero in these Figures, so that the shape of the curves can be appreciated.) Of particular interest are the separate displays for Day 1 and Day 2, which show the data in comparison to logarithmic functions. These displays indicate that for both days, the data are in fact quite convincingly logarithmically organized (R^2 = .85 and .95, respectively), as would be commonly expected for learning curves (e.g., Crossman, 1959). No evidence is shown indicating any

fatigue effects, i.e. upturn of curves, within either day, although a "warm-up" effect is shown for the initial block on Day 2 in particular.

Insert Figures 1a-c about here

Inferential statistics further confirm PTPs improved across blocks. *t*-tests comparing average PTPs for the first block on Day1 to the best (lowest) block overall, indicated a significant improvement from first to best block (p=.00000005; Table 3). Two additional *t*-tests compared PTP changes from first block to best block within each day. For both Day 1 and Day 2, again, significant differences were shown ($p < .001$ for both tests; Table 3). Also these results are consistent with learning, without any intervention. In sum, group data provide evidence that PTP values are vulnerable to the effects of repetition, in particular learning (but not fatigue), for the trial blocks assessed.

Insert Table 3 about here

Individual data. Data for individual participants are shown in Appendix B, which provides each subject's average PTP and standard deviation for each string and each block in the series. The Appendix shows that not only group PTP data improved across blocks from baseline. Fully 100% of participants (19/19) improved from baseline to some block across the two days of the study. The amount of improvement in PTP from the first to the best block ranged from a modest 0.666 cm H20 to an impressive 5.42 cm H20. The average improvement from first to

best block, using individual data, was 2.42 cm H20, representing an approximately 25% reduction in PTP, on average.

Regarding the pattern of PTP change for individual participants, Table 4 shows the number of individuals who obtained their best (lowest) PTP value as a function of study block. As noted, no participants achieved best PTP performance on block 1. All of the remaining blocks, from 2-10, showed the best performance for at least one subject, with the exception of block 7. Thus, no strong conclusions could be drawn about the number of trials required to minimize PTP or saturate learning in absolute. However, inspection of Table 4 does indicate that more participants achieved their best (lowest) PTP performance in later blocks within a given experimental day, i.e. block 5 (Day 1) and blocks 8-9 (Day 2), as compared to earlier blocks in a day. Moreover, most participants (11/19; 58%) achieved their best overall production on Day 2, in comparison to fewer participants who achieved their best performance on Day 1 (8/19; 42%).

Insert Table 4 about here

However, individual data fail to reveal anything else systematic about the pattern of PTP changes across trials. Appendix C shows average PTP for each block (1-10) for each subject, in figure format. That Appendix indicates that the specific pattern of PTP changes appeared idiosyncratic across participants.

PTP standard deviations

Group data. Average PTP standard deviations (SDs) were somewhat less illuminating in terms of potential repetition effects. Table 5 shows that the group SD was 0.97 cm H20 in block 1 (Day 1). The best (lowest) group SD, 0.77 cm H20, occurred in the next-to-last block in

the study, block 9, on Day 2. However, unlike results for group PTP data, the progression from first to best block was anything but systematic. Group SDs were characterized by an immediate worsening to 1.04 cm H20 in block 2, hovered between 0.82-0.89 cm H20 across blocks 3 (Day 1) and 8 (Day 2), then dove to reflect the most stable performance in block 9 before returning to a nearly baseline value of 0.91 cm H20 in the final block on Day 2. Figure 2 displays the data graphically. Arguably, the initial increase in the group SD in block 2 compared to block 1 could speak to destabilization suggested as inherent to learning according to a dynamical system perspective (e.g., Haken, Kelso & Bunz, 1985; see also Lee, Swinnen & Verschueren, 1995), and the final increase in group SD in block 10 could indicate fatigue. However, the arguments are anything but compelling.

Insert Figure 2 and Table 5 about here

Despite these findings, inferential statistics did indicate some evidence of PTP stabilization across blocks. *t*-tests comparing group SDs for the first block on Day1 to the best (lowest) value on either day do indicate a significant improvement ($p = .0003$). Two other *t*-tests assessed changes in group SDs for the first block each day and the best block on that same day. For both Day 1 and Day 2, again, significant differences were shown ($p = .002$ for Day 1 and .0002 for Day 2), indicating participants' best performance each day was achieved after the initial block, based on group data.

Insert Table 6 about here

Individual data. Appendix B shows within-utterance standard deviations (SDs) in PTP, as well as average standard deviations in PTP for each block, for each subject. As for PTP data, 100% of participants (19/19) achieved their lowest within-block SDs on some block after the initial one. This finding implies that, as for PTP itself, participants' stability for the PTP task may have also been influenced by practice effects. Individual SD values ranged from 0.28 – 2.39 cm H20. The average change in SD from first to best block was 0.58 cm H20, representing a 52% improvement in the stability of PTP performance across repetitions.

Table 7 shows the number of participants who achieved their smallest SD in each study block. Results were roughly similar to those found for PTP data. All blocks showed improvement in SDs compared to baseline (block 1) for at least one subject. Again, there was a general tendency for later blocks in a day to show smaller SDs than earlier blocks, although block 3 on Day 1 had the same number of participants showing improvement over baseline as block 5.

Insert Table 7 about here

Regarding individual patterns of improvements in PTP stability, curves are shown in Appendix D. As for PTP data, those curves fail to reveal anything systematic that might point to systematic learning, fatigue or plateau effects across participants or even clusters of participants.

4.0 DISCUSSION

The purpose of the study was to pursue the following questions at a preliminary, exploratory level: (1) Is any preliminary evidence shown for systematic effects of repetition on PTP averages and standard deviations (SDs), for group or individual data, with repetition of the PTP task up to a 24-hr retention interval? (2) What is the *amount* of change in PTP and PTP SD that might be expected as a function of task repetition? and (3) Does any evidence emerge about the average number of repetitions needed to saturate learning for the PTP task while at the same time protecting from fatigue effects?

Regarding the first question, results from the present study suggested PTP is clearly vulnerable to learning effects in particular. All participants improve in PTP performance from first to best block across the study. Moreover, within-day group PTP change curves were logarithmic, consistent with classic curves reported for motor learning (e.g. Crossman et al., 1959), and statistical tests confirmed participants improved PTPs not only from first to best block overall, but also from first to best block within each day of the study. PTP SDs also indicated significant improvements from first to best block overall, and from first to best block within each study day, indicating not only PTP but also PTP stability improved with repetition.

Regarding the amount of change that might occur with PTP task repetition, group data indicated PTPs improved, on average, from 9.71 cm H20 at baseline to 8.00 cm H20 at the end of the study. Individual improvements ranged from changes of 0.67 – 5.42 cm H20, on average

2.42 cm H20 or 25%. Especially the higher numbers in these estimates patently exceed changes in PTP expected with a variety of interventions (e.g., Verdolini, Titze, & Fennell, 1994; Verdolini et al., 2002, Sivasankar & Fisher, 2002). Group PTP SDs improved over trials from 0.97 cm H20 at baseline to a minimum of 0.77 cm H20 in the second-to-last block of the study. PTP SD values for individual participants ranged from 0.28 - 2.39 cm H20, with an average improvement of 0.58 cm H20 (52%).

Regarding the number of trial blocks needed to saturate learning without invoking fatigue, group data suggest that later blocks within a given day had lower PTP values and more weakly, lower PTP SD values, than earlier blocks. Also based on group data, the best overall PTP performance tended to occur for the final blocks of the study, i.e. for blocks 8-10 (3^{rd}, 4^{th}, and 5^{th} blocks on Day 2) and the majority of participants achieved their best PTP performance on Day 2. However, although it appeared saturation for PTP might have been approached during final blocks on Day 2, and PTP SDs did increase for the final block on Day 2 indicating possible fatigue, further trials would be required to confirm those impressions. Moreover, any predictions based on these impressions would be based on group data. The specific pattern of PTP and PTP SD improvements appeared highly idiosyncratic across participants.

Turning to study limitations, limitations are clear. First, although evidence implying the approach of an asymptote in PTP performance was shown in the data, at the end of the study average PTP values continued to decline even if marginally only. Future studies should examine PTP performance beyond the number of blocks examined here, to confirm asymptote – perhaps by inducing signs of fatigue.

Second, there was inadvertent deviation from the standard accepted approach to PTP analysis, which estimated "phonatory" subglottal pressure from pressure peaks occurring during

voiceless /p/ productions in the /pi pi pi pi pi/ task. The standard approach interpolates phonatory pressures by averages pressure values from pressure peaks surrounding interposed vowels. Data from the present study will be re-analyzed using the standard procedure. However, it is not anticipated that findings will be substantially changed (personal communication, Douglas Roth, February 27, 2011).

Another limitation lies with the fact that in addition to pre-recorded instructions and models of the PTP task, which were consistent across all trials for all participants, the examiner – the study author -- provided further examples and models prior to each PTP production string. There is some remote possibility that bias in this non-naïve individual could have inadvertently affected participants' PTP performance. Although also this factor should be considered in future studies, results from the present study are sufficiently "sensible" that it does not seem likely that these models substantially affected them.

Finally, there is the question about the clinical utility of this line of research. Many researchers are in a position to invite participants to return to a study site on multiple days for the purpose of saturating learning (and minimizing fatigue) for the PTP task, if these and other data warrant. However, in most clinical settings it is not feasible to ask patients to return a day after an initial evaluation to undergo saturation trials. Thus, clinicians may need to exercise caution in the interpretation of clinical PTP data before and after interventions.

In conclusion, the study provided evidence that PTP task performance is, not surprisingly, subject to repetition effects. Across two study days and a total of 50 repetitions of /pi pi pi pi pi/, PTP values systematically decreased on average and PTP SD also generally improved. Especially changes in PTP were substantial, up to more than 5 cm H20, which is greater than changes expected following many interventions. The pattern of results for group

PTP data in particular strongly suggested learning effects. Overall, the best PTP performance was seen for later over earlier trial blocks in this two-day study. Although asymptotic performance appeared to be approached by the end of Day 2 of the study, further data will be required to further examine and substantiate this claim. In the meantime, the present data may be useful to help inform the interpretation of clinical and research PTP data used to evaluate changes in laryngeal function and state across time and interventions.

5.0 TABLES

Table 1. Distribution of Pitches (and Fundamental Frequency, Fo, in Hz) Across Participants.

Pitch (Fo)	Number of Participants
C5 (523 Hz)	3
C#5 (554 Hz)	1
D5 (587 Hz)	5
D#5 (622 Hz)	3
E5 (659 Hz)	5
F5 (698 Hz)	1
F#5 (739 Hz)	1

Table 2. Average Group PTP Values (cm H20) by Block.

Block Number	Phonation Threshold Pressure (cm H20)
1 (Day 1)	9.71
2	8.34
3	8.16
4	8.04
5	8.04
6 (Day 2)	8.73
7	8.30
8	8.12
9	8.11
10	8.00

Table 3. t-Tests Comparing Group PTP (cm H20) for the First Block to Group PTP (cm H20) for the Best Block Within and Across Days.

	Mean PTP First Trial (cm H20)	Mean PTP Best Trial (cm H20)	t	df	*p-value*
Day 1 (First to Best Block Day 1)	9.71	7.48	6.79	18	0.000002
Day 2 (First to Best Block Day 2)	8.73	7.68	4.82	18	0.0001
Both Days (First Block Day 2 to Best Block Both Days)	9.71	7.233	7.25	18	0.0000005

Table 4. Number of Participants Who Achieved the Lowest PTP in Each Study Block.

Block Number	Number of Participants with Lowest PTP
1	0
2	1
3	2
4	2
5	3
6	3
7	0
8	4
9	3
10	2

Table 5. Average Group PTP SD Values (cm H20) by Block.

Block Number	Standard Deviation (cm H20)
1	0.97
2	1.04
3	0.82
4	0.87
5	0.87
6	0.89
7	0.87
8	0.85
9	0.77
10	0.91

Table 6. t-Tests Comparing Group PTP SD (cm H20) for the First Block to Group PTP SD (cm H20) for the Best Block Within and Across Days.

	Mean SD First Trial (cm H20)	Mean SD Best Trial (cm H20)	T	df	*p*-value
Day 1 (First to Best Block Day 1)	1.11	0.64	3.7	18	0.002
Day 2 (First to Best Block Day 2)	0.89	0.62	4.72	18	0.0002
Both Days (First Block Day 2 to Best Block Both Days)	1.11	0.53	5.63	18	0.0003

Table 7. Number of Participants Who Achieved the Lowest SD in Each Study Block.

Block Number	Number of Participants with Lowest SD
1	0
2	1
3	4
4	1
5	4
6	1
7	2
8	1
9	2
10	3

6.0 FIGURES

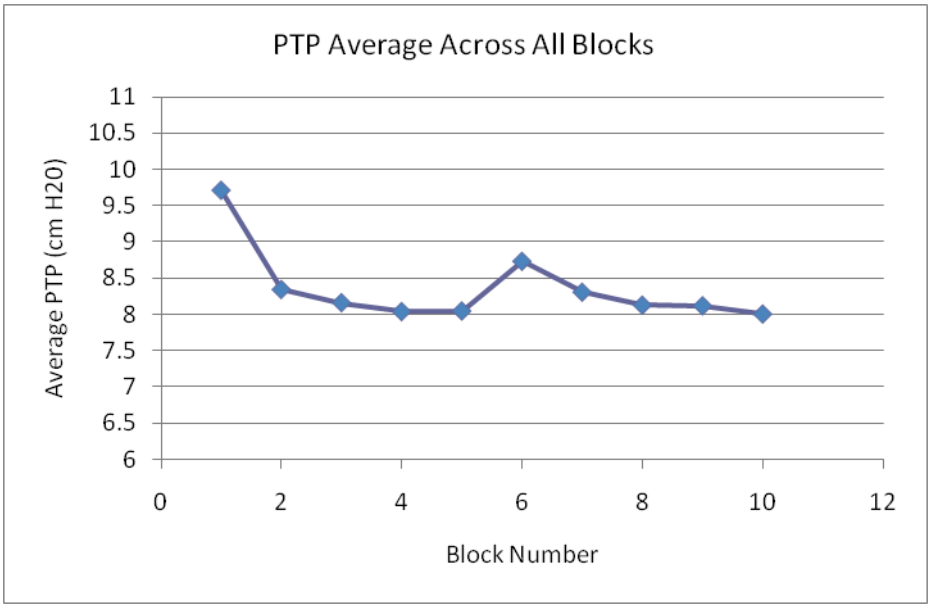


Figure 1a. Group PTP data (cm H20) across blocks for Day 1 (blocks 1-5) and Day 2 (blocks 6-10).

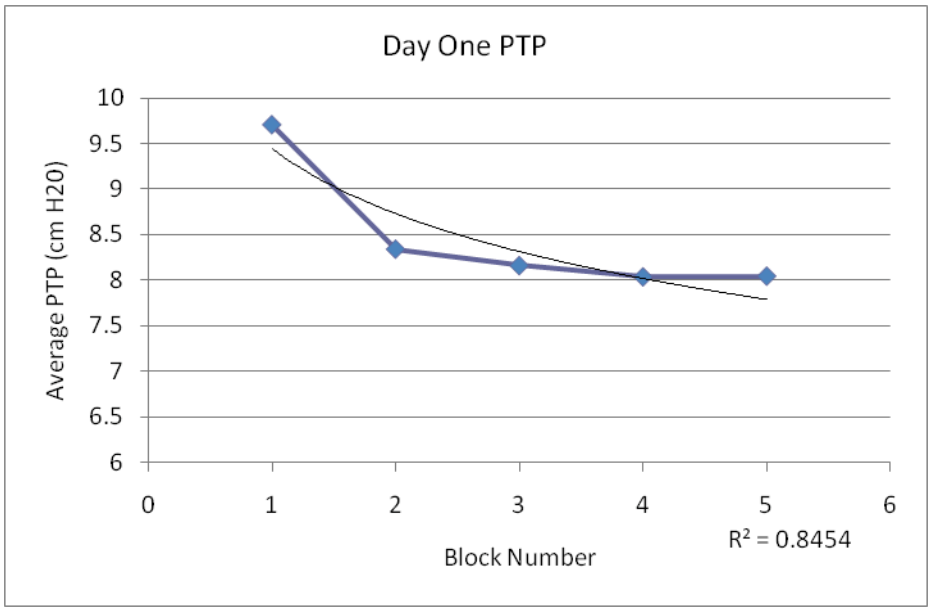


Figure 1b. Group PTP data (cm H20) across blocks for Day 1 (blocks 1-5), showing logarithmic fit to the data.

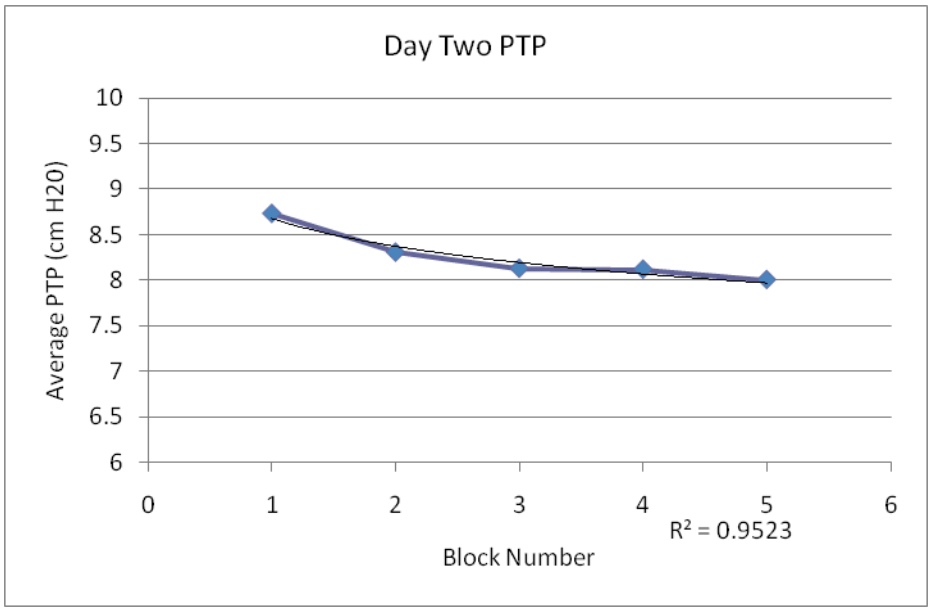


Figure 1c. Group PTP data (cm H20) across blocks for Day 2 (blocks 6-10), showing logarithmic fit to the data.

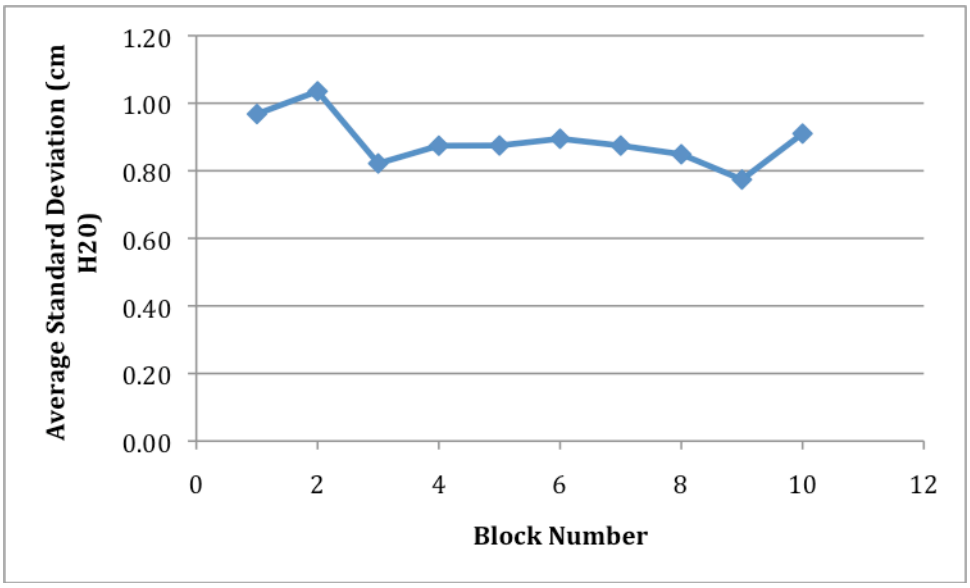


Figure 2. Group PTP standard deviation data (cm H20) across blocks for Day 1 (blocks 1-5) and Day 2 (blocks 6-10).

APPENDIX A

LEARNING QUESTIONNAIRE

Please rate the extent to which you agree with the following statements.

I consider myself an "athletic" person.	**Agree**	**Neutral**	**Disagree**
I perform new activities (ex. swimming lessons, music lessons) about the same as my peers.	**Agree**	**Neutral**	**Disagree**
I enjoy learning to play new games or activities.	**Agree**	**Neutral**	**Disagree**
I perform new activities (ex. swimming lessons, music lessons) not as well as my peers.	**Agree**	**Neutral**	**Disagree**
I catch on quickly to playing new sports.	**Agree**	**Neutral**	**Disagree**
I feel motivated to perform new activities to the best of my ability.	**Agree**	**Neutral**	**Disagree**
I perform new activities (ex. swimming lessons, music lessons) better than my peers.	**Agree**	**Neutral**	**Disagree**
I consider myself "average" when catching on to new activities or ideas.	**Agree**	**Neutral**	**Disagree**

APPENDIX B

PARTICIPANT 1, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	6.03	9.38	11.32	11.11	9.86
PTP 2	7.11	11.38	15.23	11.89	9.35
PTP 3	10.32	10.28	13.02	11.77	9.35
AVG	7.82	10.35	13.19	11.59	9.52
STDEV	2.23	1.00	1.96	0.42	
AVERAGE	**10.74**	**SD**	**2.45**		

Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.04	10.64	8.30	9.16	8.88
PTP 2	7.74	11.32	10.07	7.41	8.12
PTP 3	11.01	10.43	6.02	7.41	8.59
AVG:	8.93	10.80	8.13	7.99	8.53
STDEV:	1.81	0.47	2.03	1.01	0.38
AVERAGE	**8.88**	**SD**	**1.54**		

Block 3					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	6.38	10.22	8.74	11.70	11.85
PTP 2	6.52	5.36	6.15	11.75	9.88
PTP 3	8.61	7.23	6.88	8.35	9.14
AVG:	7.17	7.60	7.26	10.60	10.29
STDEV:	1.25	2.45	1.34	1.95	1.40
AVERAGE	**8.58**	**SD**	**2.16**		

Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	4.58	5.81	4.03	7.84	10.27
PTP 2	4.60	8.04	9.32	7.12	8.78
PTP 3	5.31	5.56	6.92	6.51	7.00
AVG:	4.83	6.47	8.12	7.16	8.68
STDEV:	0.42	1.37	2.65	0.67	1.64
AVERAGE	**6.78**	**SD**	**1.84**		

Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.63	6.29	6.20	8.01	6.73
PTP 2	5.68	7.44	9.27	6.58	12.03
PTP 3	7.98	7.98	7.51	8.05	8.63
AVG:	7.10	7.24	7.66	7.55	9.13
STDEV:	1.24	0.86	1.54	0.84	2.69
AVERAGE	**7.73**	**SD**	**1.54**		

PARTICIPANT 1, DAY 2

Block 6

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	3.68	8.76	6.55	4.34	7.31
PTP 2	5.93	6.21	5.32	5.20	7.31
PTP 3	7.01	7.33	8.92	7.95	6.92
AVG:	6.47	7.43	6.93	5.83	7.18
STDEV:	0.76	1.28	1.83	1.89	0.23

AVERAGE 6.58 **SD** 1.50

Block 7

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	8.04	7.40	7.64	8.75	6.56
PTP 2	6.41	7.40	9.58	8.65	7.39
PTP 3	6.34	7.16	10.10	6.31	8.44
AVG:	6.93	7.32	9.11	7.90	7.46
STDEV:	0.96	0.14	1.30	1.38	0.94

AVERAGE 7.74 **SD** 1.17

Block 8

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	6.74	6.48	8.14	6.36	7.54
PTP 2	6.89	6.13	5.76	4.63	
PTP 3	7.14	8.06	6.57	8.53	5.82
AVG:	6.92	6.89	6.82	6.51	6.68
STDEV:	0.20	1.03	1.21	1.95	1.22

AVERAGE 6.77 **SD** 1.06

Block 9

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	7.59	7.90	8.36		6.57
PTP 2	6.87	9.09	6.08	6.36	6.03
PTP 3		8.54	7.21	9.67	5.34
AVG	7.23	8.51	7.22	8.02	5.98
STDEV	0.51	0.60	1.14	2.34	0.62

AVERAGE 7.35 **SD** 1.31

Block 10

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	2.50	7.95	7.20	6.63	11.10
PTP 2	6.48	8.81	8.50	9.29	10.92
PTP 3	7.21	7.66	5.67	7.79	12.20
AVG	6.85	8.24	7.09	8.54	11.56
StDEV	0.52	0.60	1.42	1.33	0.69

AVERAGE 7.99 **SD** 2.39

PARTICIPANT 2, DAY 1

Block 1

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	9.26	7.7	10.7	8.32	6.68
PTP 2	8.3	8.43	8.26	6.27	6.07
PTP 3	10.44	8.45	8.45	6.38	7.14
AVG:	9.33	8.19	9.14	6.99	6.63
STDEV:	1.07	0.43	1.36	1.15	0.54

AVERAGE 8.057 **SD** 1.40

Block 2

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	7.74	5.6	8.06	9.49	9.45
PTP 2	7.09	7.53	9.86	10.35	8.77
PTP 3	5.61	7.77	10.6	10.26	9.42
AVG:	6.81	6.97	9.51	10.03	9.21
STDEV:	1.09	1.19	1.31	0.47	0.38

AVERAGE 8.51 **SD** 1.62

Block 3

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	6.5	6.23	7.71	6.3	6.28
PTP 2	6.65	6.49	7.04	7.48	7.45
PTP 3	4.44	6.28	6.52	8.68	7.54
AVG:	6.58	6.33	7.09	7.49	7.09
STDEV:	0.11	0.14	0.596	1.19	0.70

AVERAGE 6.77 **SD** 0.96

Block 4

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	7.65	9.71	9.32	7.79	8.76
PTP 2	6.85	7.59	9.77	8.27	8.54
PTP 3	8.44	10.59	9.53	7.3	8.65
AVG:	7.65	9.297	9.54	7.79	8.65
STDEV:	0.795	1.54	0.23	0.49	0.11

AVERAGE 8.58 **SD** 1.05

Block 5

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	9.27	9.45	7.91	11.1	10.57
PTP 2	9.36	9.54	9.46	10.28	9.91
PTP 3	8.9	9.4	8.97	10.26	10.08
AVG:	9.18	9.46	8.78	10.55	10.19
STDEV:	0.24	0.071	0.79	0.48	0.34

AVERAGE 9.63 **SD** 0.77

PARTICIPANT 2 DAY 2

Block 6

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	7.80	8.30	8.92	10.90	10.48
PTP 2	7.52	7.47	9.98	10.01	8.75
PTP 3	9.03	9.95	10.07	9.57	9.77
AVG:	8.12	8.57	9.66	10.16	9.67
STDEV:	0.80	1.26	0.64	0.68	0.87
AVERAGE	9.23	**SD**	1.08		

Block 7

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	9.01	8.84	8.54	9.20	9.64
PTP 2	7.59	8.68	9.27	9.35	10.58
PTP 3	7.79	8.48	10.20	10.28	9.00
AVG:	8.13	8.67	9.34	9.61	9.74
STDEV:	0.77	0.18	0.83	0.59	0.79
AVERAGE	9.10	**SD**	0.85		

Block 8

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	7.48	8.25	8.69	9.25	9.33
PTP 2	8.30	9.17	9.50	8.95	9.33
PTP 3	7.66	9.38	10.67	9.36	9.33
AVG:	7.81	8.93	9.62	9.19	
STDEV:	0.43	0.60	1.00	0.21	
AVERAGE	8.98	**SD**	0.80		

Block 9

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	9.33	9.07	8.00	9.89	9.44
PTP 2	9.50	9.07	9.26	9.29	9.44
PTP 3	9.50	9.07	9.12	9.44	9.42
AVG:	9.50	9.07	8.79	9.59	9.43
STDEV:	0.10		0.69	0.42	0.01
AVERAGE	9.25	**SD**	0.41		

Block 10

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	9.11	8.67	9.14	9.50	9.36
PTP 2	9.15	9.09	9.14	9.09	8.84
PTP 3	8.57	8.89	9.14	8.99	8.45
AVG:	8.86	8.99	9.14	9.04	8.65
STDEV:	0.41	0.14		0.07	0.28
AVERAGE	9.01	**SD**	0.28		

PARTICIPANT 3, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	6.38	7.18	6.91	6.98	8.23
PTP 2	7.56	7.18	6.43	7.55	8.21
PTP 3	7.39	6.87	6.22	7.71	6.69
AVG	7.11	7.08	6.52	7.41	7.71
STDEV	0.64	0.18	0.35	0.39	0.89
AVERAGE	7.17	**SD**	0.62		

Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	5.41	4.00	5.11	6.35	7.24
PTP 2	4.89	4.74	5.11	7.17	7.24
PTP 3	4.77	4.27	5.80	7.24	7.24
AVG	5.02	4.34	5.34	6.92	7.24
STDEV	0.34	0.37	0.40	0.49	0.00
AVERAGE	5.77	**SD**	1.20		

Block 3					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	6.35	5.40	5.63	7.50	7.66
PTP 2	9.09	5.40	4.70	5.36	8.25
PTP 3	6.43	5.14	5.34	6.89	7.75
AVG	7.29	5.31	5.22	6.58	7.89
STDEV	1.56	0.15	0.48	1.10	0.32
AVERAGE	6.46	**SD**	1.33		

Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.10	8.00	7.40	6.73	6.48
PTP 2	7.84	6.65	6.71	6.61	6.36
PTP 3	7.63	6.21	6.86	6.11	5.60
AVG	7.86	6.95	6.99	6.48	6.15
STDEV	0.24	0.93	0.36	0.33	0.48
AVERAGE	6.89	**SD**	0.75		

Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	5.72	6.50	5.86	6.28	8.35
PTP 2	5.99	7.48	5.96	6.47	7.81
PTP 3	6.42	6.50	6.29	6.68	5.84
AVG	6.04	6.83	6.04	6.48	7.33
STDEV	0.35	0.57	0.23	0.20	1.32
AVERAGE	6.54	**SD**	0.77		

PARTICIPANT 3, DAY 2

Block 6					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	5.46	5.88	6.75	5.86	7.16
PTP 2	5.49	6.21	6.70	6.29	7.88
PTP 3	5.67	6.41	6.87	6.32	7.91
AVG	5.54	6.17	6.77	6.16	7.65
STDEV	0.11	0.27	0.09	0.26	0.42
AVERAGE	6.46	**SD**	0.77		

Block 7					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	5.14	5.93	5.47	5.38	5.66
PTP 2	5.18	5.68	6.06	4.97	6.16
PTP 3	5.02	5.87	6.08	5.27	5.47
AVG	5.11	5.83	5.87	5.21	5.76
STDEV	0.08	0.13	0.35	0.21	0.36
AVERAGE	5.56	**SD**	0.40		

Block 8					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	5.59	5.18	4.37	5.88	4.94
PTP 2	4.70	4.85	5.04	5.64	5.33
PTP 3	5.68	6.06	4.78	5.83	5.91
AVG	5.32	5.36	4.73	5.78	5.39
STDEV	0.54	0.63	0.34	0.13	0.49
AVERAGE	5.32	**SD**	0.52		

Block 9					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	4.85	4.29	4.04	5.62	5.71
PTP 2	4.85	4.74	4.09	5.07	5.68
PTP 3	5.23	5.22	4.16	5.25	6.34
AVG	4.98	4.75	4.10	5.31	5.91
STDEV	0.22	0.47	0.06	0.28	0.37
AVERAGE	5.01	**SD**	0.68		

Block 10					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	5.16	5.25	4.91	4.17	4.61
PTP 2	6.12	5.89	4.42	5.07	4.54
PTP 3	5.32	5.12	4.68	5.45	4.70
AVG	5.53	5.42	4.67	4.90	4.62
STDEV	0.51	0.41	0.25	0.66	0.08
AVERAGE	5.03	**SD**	0.54		

PARTICIPANT 4, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	6.72	6.24	9.29	9.16	9.41
PTP 2	8.49	8.31	9.45	11.15	8.64
PTP 3	9.40	8.99	10.01	8.62	8.62
AVG	8.20	7.85	9.58	9.64	8.89
STDEV	1.36	1.43	0.38	1.33	0.45
AVERAGE	8.83	**SD**	1.15		

Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.10	8.83	7.96	8.72	8.34
PTP 2	8.49	8.57	6.28	8.11	8.41
PTP 3	8.65	7.77	7.52	10.24	8.62
AVG	8.41	8.39	7.25	9.02	8.46
STDEV	0.28	0.55	0.87	1.10	0.15
AVERAGE	8.31	**SD**	0.83		

Block 3					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.91	9.55	9.14	8.23	7.70
PTP 2	7.47	9.41	8.23	8.23	7.50
PTP 3	6.54	9.56	8.80	7.49	7.02
AVG	7.31	9.51	8.72	7.99	7.41
STDEV	0.70	0.08	0.46	0.43	0.35
AVERAGE	8.19	**SD**	0.94		

Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.87	8.87	8.70	7.57	8.67
PTP 2	7.19	9.31	7.92	8.77	7.55
PTP 3	7.55	10.30	9.33	10.64	8.93
AVG	7.54	9.49	8.65	8.99	8.38
STDEV	0.34	0.73	0.71	1.55	0.73
AVERAGE	8.61	**SD**	1.02		

Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.91	7.11	8.07	8.56	7.86
PTP 2	7.91	8.04	8.07	8.69	8.38
PTP 3	7.91	7.00	8.07	9.11	8.75
AVG	7.91	7.38	8.07	8.79	8.33
STDEV	0.00	0.57	0.00	0.29	0.45
AVERAGE	8.10	**SD**	0.56		

PARTICIPANT 4, DAY 2

Block 6					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.44	8.13	7.48	10.01	8.40
PTP 2	3.25	7.93	8.40	9.22	8.26
PTP 3	4.81	8.00	8.11	9.73	7.69
AVG		8.02	8.00	9.65	8.12
STDEV		0.10	0.47	0.40	0.38
AVERAGE	7.79	**SD**	0.79		

Block 7					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.54	9.14	9.58	8.44	7.90
PTP 2	10.37	7.99	9.44	7.39	8.48
PTP 3	9.33	8.78	9.22	8.47	7.26
AVG	9.41	8.64	9.41	8.10	7.88
STDEV	0.92	0.59	0.18	0.62	0.61
AVERAGE	8.69	**SD**	0.85		

Block 8					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	6.71	8.37	7.88	8.02	8.32
PTP 2	7.70	9.16	7.81	9.16	7.42
PTP 3	8.20	7.73	10.03	8.92	7.77
AVG	7.54	8.42	8.57	8.70	7.84
STDEV	0.76	0.72	1.26	0.60	0.45
AVERAGE	8.21	**SD**	0.82		

Block 9					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.30	8.48	8.26	8.54	10.01
PTP 2	9.04	8.89	7.64	8.54	8.04
PTP 3	10.62	8.46	8.54	8.06	8.59
AVG	9.65	8.61	8.15	8.38	8.88
STDEV	0.85	0.24	0.46	0.28	1.02
AVERAGE	8.73	**SD**	0.77		

Block 10					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.70	9.04	10.58	10.16	8.14
PTP 2	11.05	9.86	10.27	9.16	9.04
PTP 3	11.43	8.71	8.90	9.45	8.56
AVG	10.73	9.20	9.92	9.59	8.58
STDEV	0.91	0.59	0.89	0.51	0.45
AVERAGE	9.60	**SD**	0.95		

PARTICIPANT 5, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	12.20	19.14	20.32	20.23	19.24
PTP 2	11.20	11.99	13.51	17.64	11.36
PTP 3	9.75	15.21	14.51	12.90	13.63
AVG	11.05	15.45	16.11	16.92	14.74
STDEV					
		NOT VALID			
Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	10.31	15.66	14.27	16.33	17.16
PTP 2	14.08	17.23	17.89	12.39	16.29
PTP 3	15.85	15.46	14.11	16.14	15.54
AVG	13.41	16.12	15.42	14.95	16.33
STDEV	2.83	0.97	2.14	2.22	0.81
AVERAGE	15.25	**SD**	1.97		
Block 3					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	10.69	11.48	11.51	10.79	11.83
PTP 2	12.67	10.89	11.15	10.41	13.05
PTP 3	12.82	11.59	12.39	11.52	11.43
AVG	12.06	11.32	11.68	10.91	12.10
STDEV	1.19	0.38	0.64	0.56	0.84
AVERAGE	11.61	**SD**	0.81		
Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.72	9.94	11.49	10.73	10.67
PTP 2	11.13	9.00	9.80	10.88	11.71
PTP 3	8.72	11.65	11.17	11.06	11.35
AVG	9.86	10.20	10.82	10.89	11.24
STDEV	1.21	1.34	0.90	0.17	0.53
AVERAGE	10.60	**SD**	0.95		
Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	10.97	13.04	9.83	10.18	11.18
PTP 2	11.02	11.96	12.44	11.26	10.82
PTP 3	12.65	12.07	13.53	10.30	12.34
AVG	11.55	12.36	11.93	10.58	11.45
STDEV	0.96	0.59	1.90	0.59	0.79
AVERAGE	11.57	**SD**	1.10		

PARTICIPANT 5, DAY 2

Block 6

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	14.70	10.93	10.10	10.10	10.99
PTP 2	14.64	9.88	10.10	10.11	10.99
PTP 3	12.50	9.90	10.10	10.49	10.99
AVG	13.95	10.24	10.10	10.23	10.99
STDEV	1.25	0.60	0.00	0.22	0.00
AVERAGE	11.10	**SD**	1.60		

Block 7

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	10.99	10.08	8.78	7.24	8.75
PTP 2	11.58	8.99	11.11	9.85	7.95
PTP 3	11.79	10.05	9.53	11.58	10.41
AVG					
STDEV					

NOT VALID

Block 8

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	13.97	11.18	9.77	11.77	10.33
PTP 2	13.94	10.27	10.17	9.22	9.78
PTP 3	10.87	9.62	10.58	9.77	10.40
AVG	12.93	10.36	10.17	10.25	10.17
STDEV	1.78	0.78	0.41	1.34	0.34
AVERAGE	10.78	**SD**	1.44		

Block 9

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	12.80	11.65	12.22	11.76	13.18
PTP 2	9.41	10.10	9.89	11.80	10.02
PTP 3	11.54	11.49	11.12	11.02	10.52
AVG	11.25	11.08	11.08	11.53	11.24
STDEV	1.71	0.85	1.17	0.44	1.70
AVERAGE	11.23	**SD**	1.09		

Block 10

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	13.49	11.44	10.35	9.74	10.22
PTP 2	11.91	12.37	8.80	11.48	10.12
PTP 3	10.92	10.74	9.50	9.80	10.33
AVG	12.11	11.52	9.55	10.34	10.22
STDEV	1.30	0.82	0.78	0.99	0.11
AVERAGE	10.75	**SD**	1.22		

PARTICIPANT 6, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	12.13	13.02	15.02	13.66	14.28
PTP 2	10.82	11.81	14.07	16.65	16.80
PTP 3	13.03	14.08	14.60	15.35	13.21
AVG	11.99	12.97	14.56	15.22	14.76
STDEV	1.11	1.14	0.48	1.50	1.85
AVERAGE	13.90	**SD**	1.44		

Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1					
PTP 2					
PTP 3					

EQUIPMENT MALFUNCTION – LOST DATA

Block 3					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	10.23	10.03	12.47	12.10	11.51
PTP 2	11.51	11.95	11.42	10.35	11.81
PTP 3	10.94	11.73	9.58	11.55	11.90
AVG	10.89	11.24	11.16	11.33	11.74
STDEV	0.64	1.05	1.46	0.89	0.20
AVERAGE	11.27	**SD**	0.85		

Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.11	10.31	11.52	11.89	11.84
PTP 2	10.70	11.43	12.29	12.00	11.90
PTP 3	10.59	12.60	13.11	13.92	11.61
AVG	10.13	11.45	12.31	12.60	11.78
STDEV	0.89	1.15	0.80	1.14	0.15
AVERAGE	11.65	**SD**	1.17		

Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	11.60	10.80	11.46	11.96	11.38
PTP 2	12.34	11.35	14.82	11.98	12.44
PTP 3	14.32	10.54	11.21	11.53	12.01
AVG	12.75	10.90	12.50	11.82	11.94
STDEV	1.41	0.41	2.02	0.25	0.53
AVERAGE	11.98	**SD**	1.17		

PARTICIPANT 6, DAY 2

Block 6					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	14.24	14.69	12.14	12.26	11.53
PTP 2	14.70	13.63	11.05	12.17	13.15
PTP 3	17.33	9.79	11.70	13.73	11.74
AVG	15.42	12.70	11.63	12.72	12.14
STDEV	1.67	2.58	0.55	0.88	0.88
AVERAGE	12.92	**SD**	1.33		

Block 7					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	13.44	13.70	11.85	10.66	12.37
PTP 2	9.63	12.44	13.32	8.21	11.64
PTP 3	11.39	11.84	10.72	10.69	11.16
AVG	11.49	12.66	11.96	9.85	11.72
STDEV	1.91	0.95	1.30	1.42	0.61
AVERAGE	11.54	**SD**	1.47		

Block 8					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.64	10.47	13.30	11.11	11.77
PTP 2	12.16	11.47	9.70	11.85	13.24
PTP 3	10.84	14.44	8.30	9.60	13.31
AVG	10.88	12.13	10.43	10.85	12.77
STDEV	1.26	2.06	2.58	1.15	0.87
AVERAGE	11.41	**SD**	1.71		

Block 9					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	13.69	10.97	11.65	12.64	13.40
PTP 2	12.01	9.63	10.15	14.67	10.69
PTP 3	12.89	10.80	12.35	12.34	12.11
AVG	12.86	10.47	11.38	13.22	12.07
STDEV	0.84	0.73	1.12	1.27	1.36
AVERAGE	12.00	**SD**	1.38		

Block 10					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	12.69	10.35	11.00	11.12	10.15
PTP 2	12.00	10.42	10.17	10.17	11.39
PTP 3	11.20	10.06	10.60	9.61	11.44
AVG	11.96	10.28	10.59	10.30	10.99
STDEV	0.75	0.19	0.42	0.76	0.73
AVERAGE	10.82	**SD**	0.83		

PARTICIPANT 7, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	11.28	8.61	10.61	9.83	9.33
PTP 2	10.67	9.66	11.04	9.24	10.81
PTP 3	9.28	9.26	9.38	8.98	9.06
AVG	10.41	9.18	10.34	9.35	9.73
STDEV	1.03	0.53	0.86	0.44	0.94
AVERAGE	9.80	**SD**	0.77		

Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.19	9.13	9.42	7.28	9.46
PTP 2	11.24	9.52	9.03	8.84	9.41
PTP 3	9.72	9.72	8.64	8.75	9.52
AVG	10.05	9.46	9.23	8.06	9.46
STDEV	1.06	0.30	0.28	1.10	0.06
AVERAGE	9.26	**SD**	0.82		

Block 3					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.36	9.35	10.38	10.38	10.75
PTP 2	9.46	10.50	10.38	10.00	9.37
PTP 3	10.29	10.26	10.38	10.10	10.78
AVG	9.70	10.04		10.00	10.30
STDEV	0.51	0.61			0.81
AVERAGE	10.12	**SD**	0.50		

Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.82	8.45	7.97	8.41	7.20
PTP 2	8.42	8.21	8.38	8.92	8.66
PTP 3	8.04	8.10	7.31	7.93	8.85
AVG	8.43	8.25	7.89	8.42	8.24
STDEV	0.39	0.18	0.54	0.50	0.90
AVERAGE	8.24	**SD**	0.51		

Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.09	8.26	8.88	8.65	8.78
PTP 2	8.49	8.90	9.59	7.23	8.16
PTP 3	8.21	8.96	8.98	9.42	7.72
AVG	8.60	8.71	9.15	8.43	8.22
STDEV	0.45	0.39	0.38	1.11	0.53
AVERAGE	8.62	**SD**	0.63		

PARTICIPANT 7, DAY 2

Block 6					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	12.10	11.87	12.00	12.44	11.76
PTP 2	11.83	11.36	11.70	10.00	12.11
PTP 3	11.98	11.73	11.29	11.22	12.23
AVG	11.97	11.65	11.66	11.22	12.11
STDEV	0.14	0.26	0.36	1.22	
AVERAGE	11.71	**SD**	0.64		
Block 7					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	13.71	10.92	10.93	11.05	11.81
PTP 2	11.88	10.70	10.15	11.05	11.29
PTP 3	12.02	10.77	10.50	11.05	11.29
AVG	12.54	10.80	10.53		11.81
STDEV	1.02	0.11	0.39		
AVERAGE	11.27	**SD**	0.84		
Block 8					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	11.75	10.27	9.73	9.26	9.76
PTP 2	11.09	10.43	10.28	9.60	9.46
PTP 3	10.39	10.81	9.70	9.52	10.97
AVG	11.08	10.50	9.90	9.46	10.06
STDEV	0.68	0.28	0.33	0.18	0.80
AVERAGE	10.20	**SD**	0.72		
Block 9					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	10.96	9.85	9.20	9.93	10.12
PTP 2	10.40	9.41	10.76	10.46	9.93
PTP 3	9.83	9.83	9.02	9.48	9.88
AVG	10.40	9.70	9.66	9.97	9.93
STDEV	0.57	0.25	0.96	0.69	
AVERAGE	9.94	**SD**	0.54		
Block 10					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	10.60	9.10	8.46	7.03	8.89
PTP 2	9.52	7.47	7.19	8.65	8.77
PTP 3	9.84	8.26	8.19	8.62	8.91
AVG	9.99	8.28	7.95	8.10	8.86
STDEV	0.55	0.82	0.67	0.93	0.08
AVERAGE	8.63	**SD**	0.96		

PARTICIPANT 8, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	10.01	11.28	12.92	11.36	11.80
PTP 2	9.45	11.02	12.09	11.48	12.25
PTP 3	9.51	11.04	11.15	10.92	12.61
AVG	9.66	11.11	12.05	11.25	12.22
STDEV	0.31	0.14	0.89	0.29	0.41
AVERAGE	11.26	**SD**	0.67		
Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.99	9.52	8.53	9.08	9.09
PTP 2	9.01	8.26	8.52	8.78	8.93
PTP 3	8.61	8.29	8.19	8.59	9.69
	76.24	77.04	75.91	76.90	77.00
PTP avg/Block:	8.88	8.69	8.41	8.81	9.32
AVG	8.87	8.69	8.41	8.82	9.24
STDEV	0.23	0.72	0.19	0.25	0.40
AVERAGE	8.81	**SD**	0.44		
Block 3					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.33	8.42	8.21	8.59	8.45
PTP 2	9.33	9.28	7.96	8.37	8.22
PTP 3	8.64	9.34	8.03	7.47	8.66
AVG	8.77	9.01	8.07	8.14	8.22
STDEV	0.51	0.51	0.13	0.59	
AVERAGE	8.49	**SD**	0.52		
Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.72	8.84	8.85	9.74	8.80
PTP 2	9.24	8.34	8.80	9.52	10.37
PTP 3	8.68	8.11	8.29	10.24	10.27
AVG	9.21	8.43	8.65	9.83	9.81
STDEV	0.52	0.37	0.31	0.37	0.88
AVERAGE	9.19	**SD**	0.75		
Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.37	9.11	9.30	8.41	8.06
PTP 2	9.88	8.90	9.37	8.41	7.02
PTP 3	9.18	9.34	9.17	8.41	9.15
AVG	9.48	9.12	9.28		8.08
STDEV	0.36	0.22	0.10		1.07
AVERAGE	8.87	**SD**	0.71		

PARTICIPANT 8, DAY 2

Block 6					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	11.10	10.14	11.18	10.66	10.52
PTP 2	11.37	9.50	10.81	10.86	9.94
PTP 3	10.65	8.75	10.55	11.41	11.44
AVG	11.04	9.46	10.85	10.98	10.63
STDEV	0.36	0.70	0.32	0.39	0.76
AVERAGE	10.59	**SD**	0.79		

Block 7					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.97	9.13	8.39	9.26	8.43
PTP 2	8.82	8.32	10.06	10.39	8.58
PTP 3	8.71	8.49	9.98	10.53	9.17
AVG	8.83	8.65	9.48	10.06	8.73
STDEV	0.13	0.43	0.94	0.70	0.39
AVERAGE	9.15	**SD**	0.75		

Block 8					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.75	8.98	8.24	9.33	8.90
PTP 2	8.99	8.23	9.80	10.43	9.00
PTP 3	9.31	9.40	8.63	9.19	9.15
AVG	9.35	8.87	8.89	9.65	9.02
STDEV	0.38	0.59	0.81	0.68	0.13
AVERAGE	9.16	**SD**	0.57		

Block 9					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.48	9.60	8.97	9.52	8.88
PTP 2	9.01	9.02	9.65	8.40	8.81
PTP 3	9.02	9.16	9.11	10.02	9.45
AVG	9.17	9.26	9.24	9.31	9.05
STDEV	0.27	0.30	0.36	0.83	0.35
AVERAGE	9.21	**SD**	0.41		

Block 10					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.56	8.80	8.44	8.53	7.14
PTP 2	9.02	8.47	8.09	8.13	9.18
PTP 3	8.64	8.17	7.59	8.32	8.50
AVG	9.07	8.48	8.04	8.33	8.27
STDEV	0.46	0.32	0.43	0.20	1.04
AVERAGE	8.44	**SD**	0.60		

PARTICIPANT 9, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	5.25	6.20	8.04	8.15	8.42
PTP 2	6.40	7.69	8.29	9.42	7.71
PTP 3	6.55	8.15	7.94	9.24	8.59
AVG	6.07	7.35	8.09	8.94	8.24
STDEV	0.71	1.02	0.18	0.69	0.47
AVERAGE	7.74	**SD**	0.82		

Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	4.35	5.45	5.49	6.07	6.36
PTP 2	4.41	5.88	5.64	6.04	6.61
PTP 3	4.70	5.26	5.37	6.66	6.12
AVG	4.49	5.53	5.50	6.35	6.37
STDEV	0.19	0.32	0.14	0.44	0.35
AVERAGE	5.63	**SD**	0.73		

Block 3					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	5.78	5.71	6.60	6.87	5.74
PTP 2	4.90	5.69	5.94	5.28	5.74
PTP 3	5.48	5.54	6.17	5.89	5.74
AVG	5.19	5.65	6.27	6.01	
STDEV	0.41	0.09	0.47	0.80	
AVERAGE	5.80	**SD**	0.48		

Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	6.22	7.22	6.76	6.34	6.35
PTP 2	5.55	4.91	6.07	6.34	6.46
PTP 3	5.41	6.24	6.48	6.34	5.90
AVG	5.73	6.07	6.44		6.24
STDEV	0.43	1.63	0.35		0.30
AVERAGE	6.17	**SD**	0.56		

Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	5.56	6.32	5.05	5.20	5.25
PTP 2	4.89	6.19	5.51	5.67	5.19
PTP 3	4.97	6.06	5.36	4.98	5.13
AVG	4.93	6.19	5.28	5.28	5.19
STDEV	0.06	0.13	0.33	0.35	0.06
AVERAGE	5.42	**SD**	0.46		

PARTICIPANT 9, DAY 2

Block 6					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.39	7.49	6.63	8.71	9.23
PTP 2	7.96	7.12	8.04	8.25	7.55
PTP 3	5.97	7.59	7.04	8.89	9.09
AVG	7.11	7.40	7.24	8.62	8.62
STDEV	1.02	0.25	0.73	0.33	0.93
AVERAGE	7.80	**SD**	0.87		

Block 7					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	6.41	5.92	7.64	7.39	6.66
PTP 2	5.49	6.78	7.39	8.31	7.07
PTP 3	4.85	6.54	7.39	7.05	7.32
AVG	5.58	6.66	7.64	7.68	7.02
STDEV	0.78	0.17		0.89	0.33
AVERAGE	6.81	**SD**	0.88		

Block 8					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.38	6.64	7.84	8.82	8.33
PTP 2	6.13	7.58	6.87	8.18	7.96
PTP 3	6.45	6.38	7.17	7.00	8.09
AVG	6.65	6.98	7.29	8.00	8.13
STDEV	0.65	0.85	0.50	0.92	0.19
AVERAGE	7.39	**SD**	0.81		

Block 9					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	5.74	6.76	8.79	8.19	7.28
PTP 2	6.09	8.08	8.01	7.47	8.09
PTP 3	6.44	6.41	7.41	7.37	7.98
AVG	6.09	7.25	8.07	7.68	7.78
STDEV	0.35	1.18	0.69	0.45	0.44
AVERAGE	7.34	**SD**	0.88		

Block 10					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	5.25	7.44	7.82	7.21	9.25
PTP 2	4.57	6.58	7.25	7.79	7.33
PTP 3	5.12	7.27	7.00	7.33	6.80
AVG	4.98	7.01	7.36	7.44	7.79
STDEV	0.36	0.61	0.42	0.31	1.29
AVERAGE	6.93	**SD**	1.18		

PARTICIPANT 10, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.56	9.74	10.43	11.37	10.77
PTP 2	7.93	10.35	10.15	11.65	11.08
PTP 3	8.95	10.89	10.05	11.80	11.15
AVG	8.15	10.33	10.21	11.61	11.00
STDEV	0.72	0.58	0.20	0.22	0.20
AVERAGE	10.26	**SD**	0.65		

Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	6.88	7.74	8.28	8.00	8.40
PTP 2	9.60	8.85	8.53	8.56	8.37
PTP 3	7.55	9.14	8.73	8.50	8.08
AVG	8.01	8.58	8.51	8.35	8.28
STDEV	1.42	0.74	0.23	0.31	0.18
AVERAGE	8.35	**SD**	0.66		

Block 3					
	Set 1	**Set 2**	**Set3**	**Set 4**	**Set 5**
PTP 1	8.21	8.60	9.53	9.21	8.76
PTP 2	9.24	8.71	9.40	9.11	9.78
PTP 3	8.88	9.09	9.46	9.81	7.56
AVG	8.78	8.80	9.46	9.38	8.70
STDEV	0.52	0.26	0.07	0.38	1.11
AVERAGE	9.02	**SD**	0.60		

Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.86	7.07	7.98	6.75	7.73
PTP 2	8.15	6.73	8.58	9.47	8.02
PTP 3	8.40	8.69	8.85	8.70	6.89
AVG	8.14	7.50	8.47	8.31	7.55
STDEV	0.27	1.05	0.45	1.40	0.59
AVERAGE	7.99	**SD**	0.83		

Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.40	9.07	6.39	6.35	8.48
PTP 2	8.19	8.92	8.30	6.35	9.54
PTP 3	8.44	8.00	9.32	9.84	8.37
AVG	8.68	8.66	8.00	7.51	8.80
STDEV	0.64	0.58	1.49	2.01	0.65
AVERAGE	8.33	**SD**	1.15		

PARTICIPANT 10, DAY 2

Block 6					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.40	9.59	7.79	8.44	7.85
PTP 2	9.10	9.50	7.63	8.44	8.28
PTP 3	9.36	9.92	9.04	9.16	7.61
AVG	9.29	9.67	8.15	8.68	7.91
STDEV	0.16	0.22	0.77	0.42	0.34
AVERAGE	8.74	**SD**	0.82		

Block 7					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	16.42	7.87	8.92	7.72	7.08
PTP 2	8.84	8.12	7.57	7.94	7.63
PTP 3	9.97	7.15	7.63	7.75	8.29
AVG	11.74	7.71	8.04	7.85	7.36
STDEV	4.09	0.50	0.76	0.13	0.39
AVERAGE	8.59	**SD**	2.29		

Block 8					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.89	10.11	9.24	9.28	10.00
PTP 2	9.56	9.56	10.15	9.24	9.49
PTP 3	10.26	8.13	9.11	9.25	8.47
AVG	9.57	9.27	9.63	9.26	9.32
STDEV	0.69	1.02	0.74	0.02	0.78
AVERAGE	9.38	**SD**	0.61		

Block 9					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.29	8.22	7.53	5.68	5.78
PTP 2	8.09	7.20	8.03	6.96	9.41
PTP 3	8.54	8.55	7.20	6.25	7.92
AVG	8.31	7.99	7.59	6.30	7.70
STDEV	0.23	0.70	0.42	0.64	1.82
AVERAGE	7.58	**SD**	1.07		

Block 10					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.46	8.83	10.68	8.42	7.21
PTP 2	8.33	9.74	10.22	8.47	7.56
PTP 3	11.23	8.66	7.77	8.53	5.87
AVG	9.01	9.08	9.56	8.47	6.88
STDEV	1.97	0.58	1.56	0.06	0.89
AVERAGE	8.60	**SD**	1.41		

PARTICIPANT 11, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	12.43	11.32	13.19	11.35	10.32
PTP 2	11.94	11.84	13.13	10.81	10.38
PTP 3	13.01	13.20	13.95	11.09	9.00
AVG	12.46	12.12	13.42	11.08	9.90
STDEV	0.54	0.97	0.46	0.27	0.78
AVERAGE	11.80	**SD**	1.37		

Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.14	5.77	4.86	6.01	5.62
PTP 2	8.26	6.08	4.87	6.42	6.19
PTP 3	8.59	6.67	4.80	6.96	6.40
AVG	8.33	6.17	4.84	6.46	6.07
STDEV	0.23	0.46	0.04	0.48	0.40
AVERAGE	6.38	**SD**	1.20		

Block 3					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.15	8.25	6.18	4.60	7.64
PTP 2	8.53	7.44	6.50	7.46	7.10
PTP 3	7.90	7.10	7.04	6.70	8.13
AVG	8.53	7.60	6.57	6.25	7.62
STDEV	0.63	0.59	0.43	1.48	0.52
AVERAGE	7.31	**SD**	1.09		

Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.49	5.80	6.82	7.89	10.84
PTP 2	7.70	7.28	6.89	6.84	9.89
PTP 3	7.69	7.61	10.18	7.64	9.10
AVG	7.63	6.90	7.96	7.24	9.94
STDEV	0.12	0.96	1.92	0.57	0.87
AVERAGE	7.98	**SD**	1.41		

Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.70	9.84	6.77	6.65	5.61
PTP 2	11.93	8.62	6.41	7.08	9.17
PTP 3	11.00		7.37	9.72	6.76
AVG	10.88	9.23	6.85	7.82	7.18
STDEV	1.12	0.86	0.48	1.66	1.82
AVERAGE	8.33	**SD**	1.93		

PARTICIPANT 11, DAY 2

Block 6

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	12.80	10.32	8.85	10.22	11.41
PTP 2	13.08	10.67	7.80	11.06	11.87
PTP 3	11.59	7.80	10.17	10.57	9.25
AVG	12.49	9.60	8.94	10.62	10.84
STDEV	0.79	1.57	1.19	0.42	1.40
AVERAGE	10.50	**SD**	1.32		

Block 7

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	10.70	9.88	9.05	9.23	9.21
PTP 2	10.17	8.76	8.29	9.94	9.46
PTP 3	9.43	8.36	8.77	9.44	8.89
AVG	10.10	9.00	8.70	9.54	9.19
STDEV	0.64	0.79	0.38	0.36	0.29
AVERAGE	9.31	**SD**	1.93		

Block 8

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	10.72	6.90	9.05	9.69	10.50
PTP 2	11.75	7.24	9.05	8.01	6.24
PTP 3	10.56	6.57	12.68	9.67	5.91
AVG	11.01	6.90	12.68	9.12	7.55
STDEV	0.65	0.34		0.96	2.56
AVERAGE	8.97	**SD**	2.09		

Block 9

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	9.16	9.34	8.85	10.19	8.68
PTP 2	9.34	8.71	5.56	8.62	7.68
PTP 3	10.34	8.97	9.84	6.85	6.94
AVG	9.61	8.84	8.08	8.55	7.77
STDEV	0.64	0.18	2.24	1.67	0.87
AVERAGE	8.60	**SD**	1.33		

Block 10

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	9.15	9.43	10.03	7.04	8.63
PTP 2	7.77	6.60	10.59	7.07	8.69
PTP 3	6.76	8.30	10.04	7.47	9.93
AVG	7.89	8.11	10.22	7.19	9.08
STDEV	1.20	1.42	0.32	0.24	0.73
AVERAGE	8.50	**SD**	1.33		

PARTICIPANT 12, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.88	8.82	9.27	9.75	10.00
PTP 2	9.59	9.14	8.62	8.45	8.89
PTP 3	9.61	7.40	8.58	9.64	8.46
AVG	9.69	8.45	8.82	9.28	9.12
STDEV	0.16	0.93	0.39	0.72	0.79
AVERAGE	9.07	**SD**	0.71		
Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	10.06	8.25	6.98	7.79	7.25
PTP 2	8.94	7.66	7.58	7.12	6.56
PTP 3	7.95	7.06	7.37	8.34	6.55
AVG	8.98	7.66	7.28	7.75	6.79
STDEV	1.06	0.60	0.42	0.61	0.40
AVERAGE	7.70	**SD**	0.93		
Block 3					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.07	7.87	7.24	8.01	6.69
PTP 2	7.56	7.19	7.47	7.99	5.42
PTP 3	7.89	7.07	7.14	7.72	5.83
AVG	7.84	7.38	7.28	7.91	5.98
STDEV	0.26	0.43	0.17	0.16	0.65
AVERAGE	7.28	**SD**	0.79		
Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.22	6.46	6.51	6.28	7.18
PTP 2	6.89	5.57	6.40	5.51	6.36
PTP 3	6.08	6.23	6.37	6.67	5.92
AVG	6.73	6.09	6.43	6.15	6.49
STDEV	0.59	0.46	0.07	0.59	0.64
AVERAGE	6.38	**SD**	0.50		
Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.56	6.18	4.00	7.20	6.60
PTP 2	6.19	5.09	5.58	6.63	6.61
PTP 3	6.63		6.04	6.98	6.19
AVG	6.79	5.64	5.81	6.94	6.40
STDEV	0.70	0.77	0.33	0.29	0.30
AVERAGE	6.25	**SD**	0.90		

PARTICIPANT 12, DAY 2

Block 6

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	7.68	7.28	7.12	6.32	7.50
PTP 2	7.11	6.80	7.58	6.97	7.73
PTP 3	7.18	6.72	7.39	7.95	8.53
AVG	7.32	6.93	7.49	7.08	7.92
STDEV	0.31	0.30	0.13	0.82	0.54
AVERAGE	7.32	**SD**	0.60		

Block 7

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	8.16	6.11	6.34	5.80	7.00
PTP 2	8.02	6.52	6.38	6.18	5.41
PTP 3	7.44	6.50	6.79	6.99	6.41
AVG	7.87	6.38	6.50	6.32	6.27
STDEV	0.38	0.23	0.25	0.61	0.80
AVERAGE	6.67	**SD**	0.76		

Block 8

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	5.98	6.39	5.69	7.13	7.35
PTP 2	6.98	6.54	6.91	6.82	7.37
PTP 3	7.13	5.77	6.38	7.36	6.38
AVG	6.70	6.23	6.33	7.10	7.03
STDEV	0.63	0.41	0.61	0.27	0.57
AVERAGE	6.68	**SD**	0.57		

Block 9

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	8.10	7.01	7.07	7.15	7.86
PTP 2	6.92	6.56	6.44	6.32	7.27
PTP 3	6.98	5.56	7.61	6.49	6.61
AVG	7.33	6.38	7.04	6.65	7.25
STDEV	0.66	0.74	0.59	0.44	0.63
AVERAGE	6.93	**SD**	0.64		

Block 10

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	7.80	7.75	4.98	7.46	5.85
PTP 2	8.31	6.75	7.49	6.56	7.23
PTP 3	8.75	7.67	7.70	6.98	6.82
AVG	8.29	7.39	6.72	7.00	6.63
STDEV	0.48	0.56	1.51	0.45	0.71
AVERAGE	7.21	**SD**	0.94		

PARTICIPANT 13, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	10.26	9.58	7.11	9.93	10.11
PTP 2	9.89	9.47	8.33	9.92	9.93
PTP 3	9.86	9.11	8.98	9.13	10.07
AVG	10.00	9.29	8.14	9.66	10.04
STDEV	0.22	0.25	0.95	0.46	0.09
AVERAGE	9.45	**SD**	0.88		

Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.52	8.52	9.71	9.26	8.44
PTP 2	9.56	9.80	9.63	8.90	6.94
PTP 3	9.49	8.76	8.97	8.27	9.63
AVG	9.56	9.03	9.44	8.81	8.29
STDEV		0.68	0.41	0.50	1.90
AVERAGE	9.03	**SD**	0.77		

Block 3					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.83	8.21	8.94	8.96	8.02
PTP 2	7.32	7.87	7.01	8.92	8.44
PTP 3	8.08	7.87	7.52	9.43	8.00
AVG	7.58	8.21	7.82	9.10	8.15
STDEV	0.36		1.00	0.28	0.25
AVERAGE	8.16	**SD**	0.67		

Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.50	8.32	8.09	8.46	9.11
PTP 2	8.76	8.56	7.66	8.45	9.40
PTP 3	8.09	7.96	7.47	8.28	8.40
AVG	8.78	8.28	7.74	8.40	8.97
STDEV	0.71	0.30	0.32	0.10	0.51
AVERAGE	8.43	**SD**	0.58		

Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.99	8.94	8.17	8.83	8.75
PTP 2	8.32	7.93	8.20	8.48	8.91
PTP 3	8.61	7.50	8.88	8.75	8.66
AVG	8.64	8.12	8.42	8.69	8.77
STDEV	0.34	0.74	0.40	0.18	0.13
AVERAGE	8.53	**SD**	0.43		

PARTICIPANT 13, DAY 2

Block 6

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	10.46	9.39	9.27	7.79	8.00
PTP 2	10.31	9.52	9.01	8.13	8.56
PTP 3	9.70	6.82	7.90	8.30	7.46
AVG	10.16	8.58	8.73	8.07	8.01
STDEV	0.40	1.52	0.73	0.26	0.55
AVERAGE	8.71	**SD**	0.83		

Block 7

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	8.15	8.86	8.22	9.34	8.90
PTP 2	8.61	8.39	8.21	8.17	7.59
PTP 3	9.15	8.17	6.78	8.77	8.56
AVG	8.64	8.47	7.74	8.76	8.35
STDEV	0.50	0.35	0.83	0.59	0.68
AVERAGE	8.39	**SD**	0.63		

Block 8

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	7.75	8.29	8.45	7.45	8.87
PTP 2	8.77	7.84	7.25	7.77	8.70
PTP 3	9.20	7.70	7.44	7.96	7.76
AVG	8.57	7.94	7.71	7.73	8.44
STDEV	0.74	0.31	0.65	0.26	0.60
AVERAGE	8.08	**SD**	0.59		

Block 9

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	9.25	9.51	9.23	8.06	7.65
PTP 2	9.10	9.74	8.19	8.19	7.35
PTP 3	8.97	8.36	7.58	8.28	7.59
AVG	9.11	9.20	8.33	8.24	7.53
STDEV	0.14	0.74	0.83	0.06	0.16
AVERAGE	8.47	**SD**	0.77		

Block 10

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	8.46	9.21	5.74	8.38	7.82
PTP 2	9.10	9.12	7.87	8.62	8.05
PTP 3	8.23	7.62	6.93	8.06	7.21
AVG	8.60	8.65	6.85	8.35	7.69
STDEV	0.45	0.89	1.07	0.28	0.43
AVERAGE	8.03	**SD**	0.92		

PARTICIPANT 14, DAY 1

Block 1

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	8.65	11.53	12.98	12.57	11.73
PTP 2	10.93	12.60	12.74	12.77	11.64
PTP 3	10.93	12.69	12.21	11.48	11.56
AVG	10.17	12.27	12.64	12.27	11.64
STDEV	1.31	0.65	0.39	0.69	0.09
AVERAGE	11.80	**SD**	1.11		

Block 2

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	13.06	11.78	9.64	10.09	9.06
PTP 2	11.37	11.78	10.73	9.91	10.14
PTP 3	11.24	10.90	10.09	10.09	10.04
AVG	12.22	10.90	10.19	10.00	9.60
STDEV	1.20		0.77	0.13	0.76
AVERAGE	10.66	**SD**	1.03		

Block 3

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	9.80	9.47	7.75	8.94	9.16
PTP 2	11.14	9.57	8.24	9.93	8.46
PTP 3	11.47	8.36	9.32	8.65	8.87
AVG	10.80	9.13	8.44	9.17	8.83
STDEV	0.88	0.67	0.80	0.67	0.35
AVERAGE	9.28	**SD**	1.02		

Block 4

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	8.73	9.85	8.40	7.84	6.59
PTP 2	10.45	9.22	7.67	7.22	7.37
PTP 3	10.29	8.97	7.81	7.69	6.92
AVG	9.82	9.35	7.96	7.58	6.96
STDEV	0.95	0.45	0.39	0.32	0.39
AVERAGE	8.33	**SD**	1.21		

Block 5

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	7.25	7.21	6.93	7.42	8.02
PTP 2	6.77	7.30	8.15	6.67	8.26
PTP 3	6.91	6.94	7.83	7.72	7.80
AVG	6.98	7.15	7.64	7.27	8.03
STDEV	0.25	0.19	0.63	0.54	0.23
AVERAGE	7.41	**SD**	0.52		

PARTICIPANT 14, DAY 2

Block 6

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	10.24	7.70	7.03	6.80	6.23
PTP 2	10.08	8.06	7.31	6.34	7.21
PTP 3	9.76	7.99	7.04	5.70	7.11
AVG	10.03	7.92	7.13	6.28	6.85
STDEV	0.24	0.19	0.16	0.55	0.54

AVERAGE 7.64 **SD** 1.39

Block 7

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	9.03	7.22	7.60	7.15	6.62
PTP 2	7.17	7.92	6.20	6.60	6.36
PTP 3	8.74	8.89	7.21	6.95	6.41
AVG	8.31	8.01	7.00	6.90	6.46
STDEV	1.00	0.84	0.72	0.28	0.14

AVERAGE 7.34 **SD** 0.93

Block 8

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	7.62	7.16	6.71	6.28	6.44
PTP 2	8.16	6.64	5.87	5.78	4.98
PTP 3	6.97	6.37	5.92	6.03	6.15
AVG	7.58	6.72	6.17	6.03	5.86
STDEV	0.60	0.40	0.47	0.25	0.77

AVERAGE 6.47 **SD** 0.79

Block 9

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	8.42	6.60	6.52	6.42	7.18
PTP 2	8.38	6.01	6.54	5.53	6.89
PTP 3	7.74	5.36	6.21	6.28	6.25
AVG	8.18	5.99	6.42	6.08	6.77
STDEV	0.38	0.62	0.19	0.48	0.48

AVERAGE 6.69 **SD** 0.91

Block 10

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	8.64	8.19	5.21	6.09	6.51
PTP 2	7.71	7.64	7.23	6.32	6.40
PTP 3	7.92	7.65	6.76	6.56	6.29
AVG	8.09	7.83	6.40	6.32	6.40
STDEV	0.49	0.31	1.06	0.24	0.11

AVERAGE 7.01 **SD** 0.93

PARTICIPANT 15, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.82	9.88	8.25	8.14	7.25
PTP 2	8.29	8.87	8.77	7.88	7.42
PTP 3	7.45	8.61	8.56	7.48	7.69
AVG	8.19	9.12	8.53	7.83	7.45
STDEV	0.69	0.67	0.26	0.33	0.22
AVERAGE	8.22	**SD**	0.76		

Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.29	7.51	7.76	7.77	7.08
PTP 2	7.36	6.65	7.56	7.72	7.57
PTP 3	7.52	7.02	7.67	7.46	7.15
AVG	7.39	7.06	7.66	7.65	7.27
STDEV	0.12	0.43	0.10	0.17	0.27
AVERAGE	7.41	**SD**	0.32		

Block 3					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	6.49	7.72	7.65	7.84	8.21
PTP 2	7.46	7.56	8.10	7.92	8.21
PTP 3	7.03	7.10	8.12	8.21	8.21
AVG	6.99	7.46	7.96	7.99	8.21
STDEV	0.49	0.32	0.26	0.19	0.00
AVERAGE	7.72	**SD**	0.52		

Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.59	5.98	7.10	5.81	7.84
PTP 2	8.19	6.57	6.20	6.69	7.97
PTP 3	7.17	8.17	6.32	7.62	8.08
AVG	8.39	8.17		7.62	7.96
STDEV	0.28				0.12
		NOT VALID			

Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.42	6.85	6.17	6.16	5.97
PTP 2	7.82	6.85	6.29	6.09	5.95
PTP 3	7.59	5.80	6.28	6.12	6.29
AVG	7.94	6.50	6.25	6.12	6.07
STDEV	0.43		0.07		0.19
AVERAGE	6.58	**SD**	0.78		

PARTICIPANT 15, DAY 2

Block 6					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	5.87	8.41	9.25	9.31	9.66
PTP 2	7.97	9.42	8.80	9.58	9.24
PTP 3	9.00	9.19	9.31	9.32	10.09
AVG	7.61	9.01	9.12	9.40	9.66
STDEV	1.60	0.53	0.28	0.15	0.43
AVERAGE	8.96	**SD**	0.42		

Block 7					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.29	10.13	9.94	9.74	8.58
PTP 2	8.73	10.33	9.92	9.34	8.91
PTP 3	8.84	9.17	10.78	8.90	8.29
AVG	8.95	9.88	10.21	9.33	8.59
STDEV	0.30	0.62	0.49	0.42	0.31
AVERAGE	9.39	**SD**	0.72		

Block 8					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.43	9.33	7.79	8.87	8.54
PTP 2	8.13	8.60	9.09	8.94	8.54
PTP 3	8.47	9.22	9.26	8.17	8.65
AVG	8.68	9.05	8.71	8.66	8.58
STDEV	0.67	0.39	0.80	0.42	0.06
AVERAGE	8.74	**SD**	0.48		

Block 9					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.54	8.66	9.24	8.80	8.01
PTP 2	8.40	8.83	9.11	8.53	8.04
PTP 3	8.92	8.71	8.27	8.83	9.84
AVG	8.62	8.73	8.87	8.72	8.63
STDEV	0.27	0.09	0.53	0.17	
AVERAGE	8.72	**SD**	0.47		

Block 10					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	6.63	7.47	8.29	7.05	8.33
PTP 2	6.03	7.92	8.01	8.21	8.14
PTP 3	7.10	8.53	8.44	8.08	8.19
AVG	6.59	7.97	8.25	7.78	8.22
STDEV	0.54	0.53	0.22	0.64	0.13
AVERAGE	7.76	**SD**	0.74		

PARTICIPANT 16, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.31	8.03	8.44	8.38	8.69
PTP 2	7.42	7.97	7.04	7.85	7.72
PTP 3	7.62	8.17	8.44	8.33	7.91
AVG	7.78	8.06	7.97	8.19	8.11
STDEV	0.47	0.10	0.81	0.29	0.51
AVERAGE	8.08	**SD**	0.44		

Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.54	8.62	4.57	4.93	5.26
PTP 2	6.71	8.23	4.84	4.85	6.00
PTP 3	7.10	7.11	4.67	5.30	6.05
AVG	7.45	7.99	4.69	5.03	5.77
STDEV	0.96	0.78	0.14	0.24	0.44
AVERAGE	6.19	**SD**	1.45		

Block 3					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	6.34	6.77	6.65	6.35	6.43
PTP 2	6.99	7.06	8.20	6.64	6.18
PTP 3	6.63	7.06	7.41	7.17	5.91
AVG	6.65	6.97	7.42	6.72	6.17
STDEV	0.33	0.17	0.78	0.42	0.26
AVERAGE	6.79	**SD**	0.56		

Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	6.11	6.35	6.22	5.56	6.09
PTP 2	6.25	6.35	5.98	6.87	6.01
PTP 3	6.93	6.35	6.65	7.65	5.66
AVG	6.43	6.35	6.28	6.69	5.92
STDEV	0.44		0.34	1.06	0.23
AVERAGE	6.33	**SD**	0.53		

Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	6.60	6.69	6.62	6.48	6.27
PTP 2	5.76	6.78	6.72	6.11	6.60
PTP 3	6.18	6.73	6.36	6.93	7.32
AVG	6.18	6.73	6.57	6.51	6.73
STDEV	0.42	0.05	0.19	0.41	0.54
AVERAGE	6.54	**SD**	0.37		

PARTICIPANT 16, DAY 2

Block 6					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.33	6.72	7.01	7.36	6.97
PTP 2	6.02	7.41	7.01	6.34	7.19
PTP 3	6.52	6.93	5.87	6.65	7.19
AVG	6.62	7.17	5.87	6.78	7.12
STDEV	0.66	0.34		0.52	0.13
AVERAGE	6.83	**SD**	0.48		

Block 7					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.10	7.43	6.30	6.22	7.47
PTP 2	6.70	6.51	5.99	6.04	6.67
PTP 3	6.78	6.56	6.17	6.68	6.70
AVG	6.86	6.97	6.15	6.36	6.95
STDEV	0.21	0.65	0.16	0.45	0.45
AVERAGE	6.62	**SD**	0.45		

Block 8					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.01	6.35	7.02	6.07	6.93
PTP 2	6.51	6.72	6.12	6.07	5.13
PTP 3	6.49	6.47	6.08	6.07	6.41
AVG	7.00	6.51	6.41	6.07	6.03
STDEV	0.87	0.19	0.53		1.27
AVERAGE	6.43	**SD**	0.63		

Block 9					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.57	6.67	6.33	7.65	6.13
PTP 2	6.01	7.12	6.93	6.68	5.89
PTP 3	6.78	6.76	6.17	7.02	6.44
AVG	6.79	6.90	6.48	7.12	6.15
STDEV	0.78	0.32	0.40	0.49	0.28
AVERAGE	6.68	**SD**	0.53		

Block 10					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	6.45	7.10	6.42	6.69	6.24
PTP 2	6.73	7.04	6.41	6.71	5.94
PTP 3	7.06	6.74	6.51	6.53	6.71
AVG	6.75	6.96	6.45	6.64	6.30
STDEV	0.31	0.19	0.06	0.10	0.39
AVERAGE	6.62	**SD**	0.31		

PARTICIPANT 17, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.23	8.54	8.05	8.02	7.99
PTP 2	7.23	9.00	7.55	7.24	7.35
PTP 3	7.72	9.09	6.50	7.46	8.43
AVG	7.39	8.88	7.37	7.57	7.92
STDEV	0.28	0.30	0.79	0.40	0.54
AVERAGE	7.83	**SD**	0.72		

Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.66	7.77	7.61	6.59	7.56
PTP 2	7.91	7.77	7.35	6.93	6.96
PTP 3	7.88	7.93	7.27	7.16	7.50
AVG	7.82	7.82	7.41	6.89	7.34
STDEV	0.14	0.09	0.18	0.29	0.33
AVERAGE	7.46	**SD**	0.40		

Block 3					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.63	7.62	6.59	6.42	6.86
PTP 2	7.67	5.99	6.35	6.79	6.95
PTP 3	7.78	7.14	6.82	7.15	6.78
AVG	7.69	6.92	6.59	6.79	6.86
STDEV	0.08	0.84	0.24	0.37	0.09
AVERAGE	6.97	**SD**	0.53		

Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.32	7.43	7.24	6.49	7.96
PTP 2	7.96	6.85	7.04	7.09	6.66
PTP 3	8.17	7.04	6.79	6.93	6.40
AVG	8.15	7.11	7.02	6.84	7.01
STDEV	0.18	0.30	0.23	0.31	0.84
AVERAGE	7.22	**SD**	0.61		

Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.54	6.90	5.72	5.81	6.66
PTP 2	7.67	5.93	6.47	5.73	5.99
PTP 3	8.25	6.51	5.95	5.76	6.20
AVG	7.82	6.45	6.05	5.77	6.28
STDEV	0.38	0.49	0.38	0.04	0.34
AVERAGE	6.47	**SD**	0.80		

PARTICIPANT 17, DAY 2

Block 6

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	7.42	7.09	7.05	6.22	7.13
PTP 2	7.68	7.23	7.32	7.13	7.13
PTP 3	6.64	7.21	6.84	6.94	6.44
AVG	7.25	7.18	7.07	6.76	6.90
STDEV	0.54	0.08	0.24	0.48	0.40
AVERAGE	7.03	**SD**	0.38		

Block 7

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	8.32	7.04	6.89	7.16	6.31
PTP 2	6.65	6.24	6.80	5.77	6.29
PTP 3	7.04	6.96	6.44	6.80	5.82
AVG	7.34	6.75	6.71	6.58	6.14
STDEV	0.87	0.44	0.24	0.72	0.28
AVERAGE	6.70	**SD**	0.62		

Block 8

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	6.68	6.50	6.13	6.40	6.04
PTP 2	6.51	7.03	6.11	5.82	6.35
PTP 3	6.68	6.74	5.62	6.97	5.69
AVG	6.62	6.76	5.95	6.40	6.03
STDEV	0.10	0.27	0.29	0.58	0.33
AVERAGE	6.35	**SD**	0.44		

Block 9

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	7.16	6.87	6.35	6.06	6.37
PTP 2	6.65	6.47	6.54	6.43	6.82
PTP 3	7.27	6.58	6.35	6.37	6.17
AVG	7.03	6.64	6.41	6.29	6.45
STDEV	0.33	0.21	0.11	0.20	0.33
AVERAGE	6.56	**SD**	0.34		

Block 10

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	6.37	7.07	6.80	6.81	7.06
PTP 2	7.90	6.53	6.80	6.73	6.24
PTP 3	6.96	6.80	6.80	6.73	6.70
AVG	7.08	6.80	6.80	6.76	6.67
STDEV	0.77	0.27			0.41
AVERAGE	6.82	**SD**	0.37		

PARTICIPANT 18, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	7.61	8.01	9.98	8.59	8.76
PTP 2	7.81	7.52	7.26	8.30	7.34
PTP 3	7.01	8.19	8.67	8.25	7.38
AVG	7.48	7.91	8.64	8.38	7.83
STDEV	0.42	0.35	1.36	0.18	0.81
AVERAGE	8.05	**SD**	0.77		

Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	11.09	9.57	8.52	8.49	7.55
PTP 2	9.42	8.71	6.30	6.29	6.50
PTP 3	9.63	7.10	6.23	6.28	7.22
AVG	10.05	8.46	7.02	7.02	7.09
STDEV	0.91	1.25	1.30	1.27	0.54
AVERAGE	7.93	**SD**	1.54		

Block 3					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.89	8.33	7.48	9.03	8.54
PTP 2	8.08	8.55	7.97	8.49	8.54
PTP 3	7.51	7.38	7.99	8.13	7.55
AVG	8.16	8.09	7.81	8.55	8.21
STDEV	0.69	0.62	0.29	0.45	0.57
AVERAGE	8.16	**SD**	0.52		

Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.02	9.02	9.26	9.25	9.74
PTP 2	8.51	8.53	9.04	8.70	8.09
PTP 3	7.43	9.44	8.74	10.28	8.20
AVG	8.32	9.00	9.01	9.41	8.68
STDEV	0.81	0.46	0.26	0.80	0.92
AVERAGE	8.88	**SD**	0.70		

Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	10.87	9.91	8.23	8.51	7.81
PTP 2	9.73	8.76	8.25	7.36	8.36
PTP 3	8.41	7.83	8.08	7.47	8.06
AVG	9.67	8.83	8.19	7.78	8.08
STDEV	1.23	1.04	0.09	0.63	0.27
AVERAGE	8.51	**SD**	0.96		

PARTICIPANT 18, DAY 2

Block 6

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	8.95	8.63	10.81	9.82	8.24
PTP 2	8.83	8.28	10.64	7.95	8.07
PTP 3	9.82	9.59	8.07	8.25	9.17
AVG	9.20	8.83	9.84	8.67	8.49
STDEV	0.54	0.68	1.54	1.00	0.59
AVERAGE	9.01	**SD**	0.94		

Block 7

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	5.74	7.52	8.15	7.68	8.19
PTP 2	7.67	7.57	8.76	8.20	7.04
PTP 3	7.28	7.78	8.20	7.78	6.92
AVG	6.90	7.62	8.37	7.89	7.38
STDEV	1.02	0.14	0.34	0.28	0.70
AVERAGE	7.63	**SD**	0.71		

Block 8

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	8.32	8.84	6.94	7.87	8.19
PTP 2	8.80	9.42	7.42	7.04	7.80
PTP 3	8.85	9.59	7.32	7.73	7.46
AVG	8.66	9.28	7.23	7.55	7.82
STDEV	0.29	0.39	0.25	0.44	0.37
AVERAGE	8.11	**SD**	0.84		

Block 9

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	7.60	6.97	7.66	7.05	7.66
PTP 2	7.15	5.97	7.60	5.96	7.71
PTP 3	6.24	7.05	6.24	7.10	6.24
AVG	7.00	6.66	7.17	6.70	7.20
STDEV	0.69	0.60	0.80	0.64	0.83
AVERAGE	6.95	**SD**	0.65		

Block 10

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	6.75	7.03	7.64	6.73	8.95
PTP 2	7.25	5.97	7.71	7.30	7.28
PTP 3	7.11	7.09	6.23	7.11	7.78
AVG	7.04	6.70	7.19	7.05	8.00
STDEV	0.26	0.63	0.84	0.29	0.86
AVERAGE	7.20	**SD**	0.70		

PARTICIPANT 19, DAY 1

Block 1					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.35	8.87	9.22	6.86	7.01
PTP 2	7.97	8.28	7.89	7.84	7.23
PTP 3	6.37	6.63	8.20	7.01	6.11
AVG	7.56	7.93	8.44	7.24	6.78
STDEV	1.05	1.16	0.70	0.53	0.59
AVERAGE	7.59	**SD**	0.92		

Block 2					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	11.98	7.88	8.72	8.87	8.01
PTP 2	10.21	7.49	8.79	9.11	8.38
PTP 3	9.20	7.91	7.98	7.50	7.79
AVG	10.46	7.76	8.50	8.49	8.06
STDEV	1.41	0.23	0.45	0.87	0.30
AVERAGE	8.65	**SD**	1.18		

Block 3					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.12	7.71	7.00	7.21	6.43
PTP 2	6.99	6.36	6.23	6.88	7.44
PTP 3	6.96	7.69	6.82	6.46	6.22
AVG	7.69	7.25	6.68	6.85	6.70
STDEV	1.24	0.77	0.40	0.38	0.65
AVERAGE	7.03	**SD**	0.75		

Block 4					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	8.85	7.72	7.74	6.76	7.39
PTP 2	7.96	7.34	7.10	6.89	6.29
PTP 3	7.39	6.76	7.26	6.05	6.17
AVG	8.07	7.27	7.37	6.57	6.62
STDEV	0.74	0.48	0.33	0.45	0.67
AVERAGE	7.18	**SD**	0.74		

Block 5					
	Set 1	**Set 2**	**Set 3**	**Set 4**	**Set 5**
PTP 1	9.88	6.46	7.53	7.54	6.62
PTP 2	8.92	5.70	6.50	7.58	7.54
PTP 3	8.42	6.26	7.22	7.51	7.35
AVG	9.07	6.14	7.08	7.54	7.17
STDEV	0.74	0.39	0.53	0.04	0.49
AVERAGE	7.40	**SD**	1.07		

PARTICIPANT 19, DAY 2

Block 6

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	7.43	7.71	6.89	6.61	6.80
PTP 2	7.42	7.17	6.60	6.38	6.77
PTP 3	7.16	6.93	5.96	7.44	6.59
AVG	7.34	7.27	6.48	6.81	6.72
STDEV	0.15	0.40	0.48	0.56	0.11
AVERAGE	6.92	**SD**	0.47		

Block 7

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	8.81	7.63	6.74	6.88	7.30
PTP 2	8.72	7.40	5.99	6.82	7.30
PTP 3	7.85	7.38	6.61	7.28	7.30
AVG	8.46	7.47	6.45	6.99	7.30
STDEV	0.53	0.14	0.40	0.25	
AVERAGE	7.33	**SD**	0.74		

Block 8

	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	8.35	6.95	6.16	7.66	6.09
PTP 2	6.75	7.25	7.33	6.14	6.54
PTP 3	6.61	6.83	7.69	6.92	6.96
AVG	7.24	7.01	7.06	6.91	6.53
STDEV	0.97	0.22	0.80	0.76	0.43
AVERAGE	6.95	**SD**	0.63		

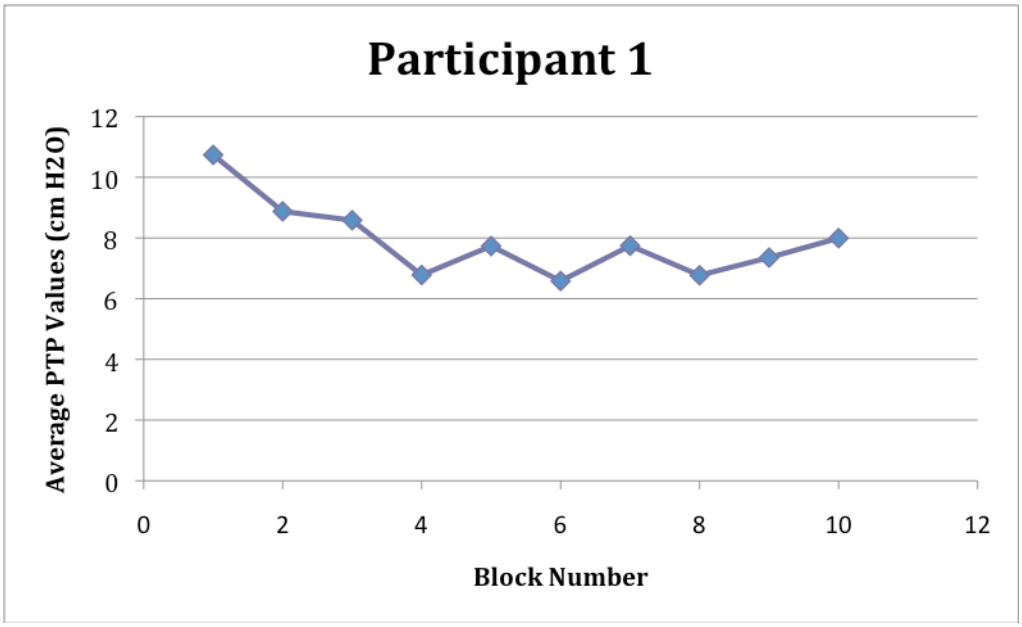
Block 9

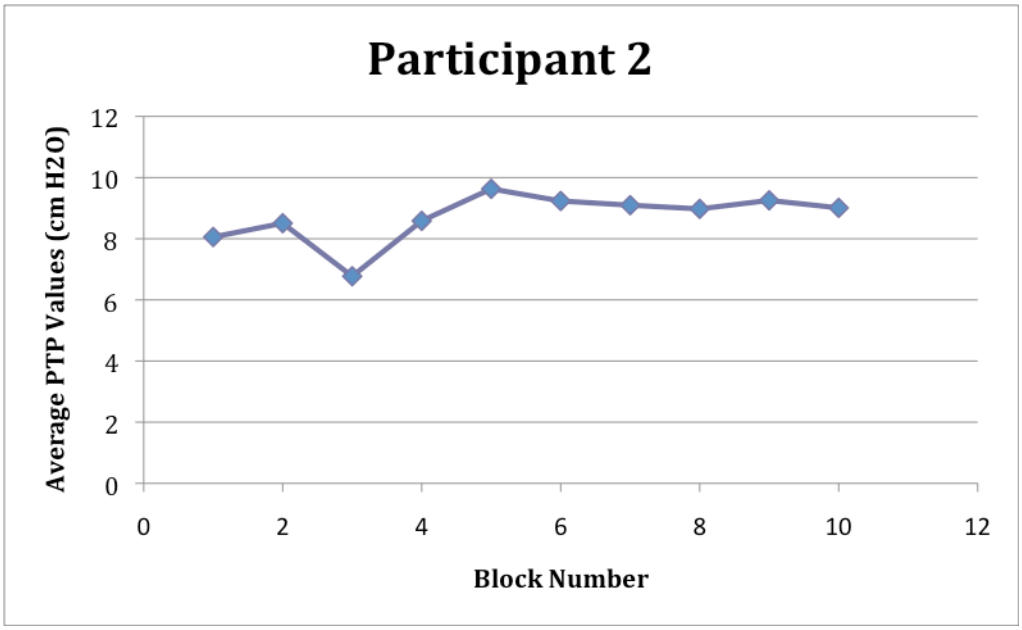
	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	7.33	7.03	6.88	6.03	7.04
PTP 2	7.86	7.29	7.03	6.45	7.09
PTP 3	7.29	7.49	6.20	6.16	6.91
AVG	7.49	7.27	6.70	6.21	7.01
STDEV	0.32	0.23	0.44	0.22	0.09
AVERAGE	6.94	**SD**	0.52		

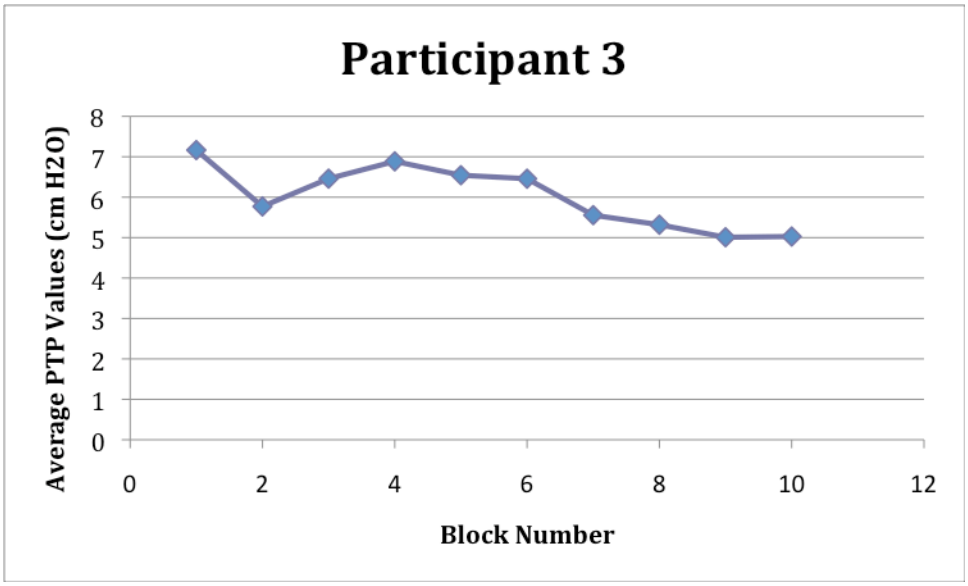
Block 10

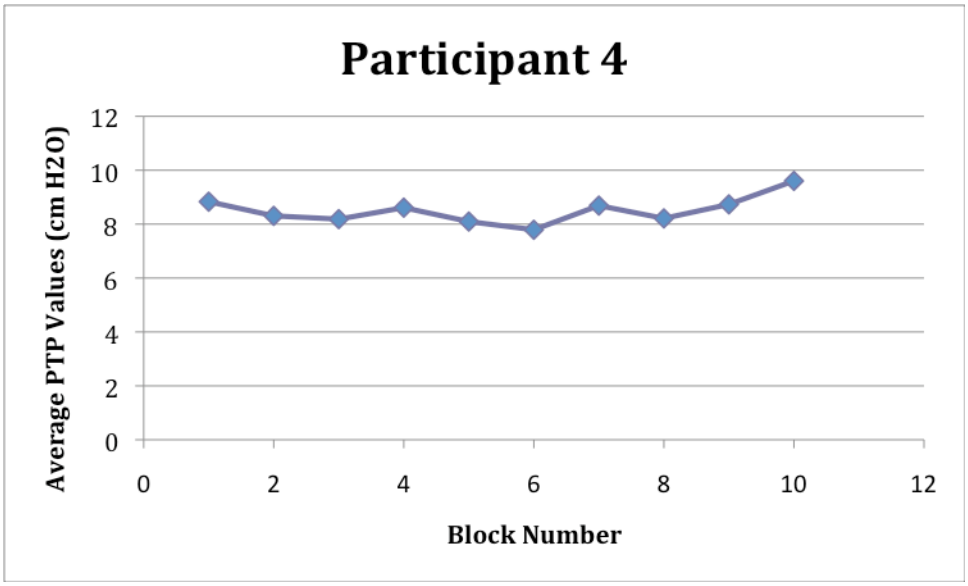
	Set 1	Set 2	Set 3	Set 4	Set 5
PTP 1	6.24	6.08	6.98	7.92	7.86
PTP 2	6.60	6.48	7.42	7.67	7.60
PTP 3	5.94	6.74	7.45	7.82	7.35
AVG	6.26	6.43	7.28	7.80	7.60
STDEV	0.33	0.33	0.26	0.13	0.26
AVERAGE	7.08	**SD**	0.68		

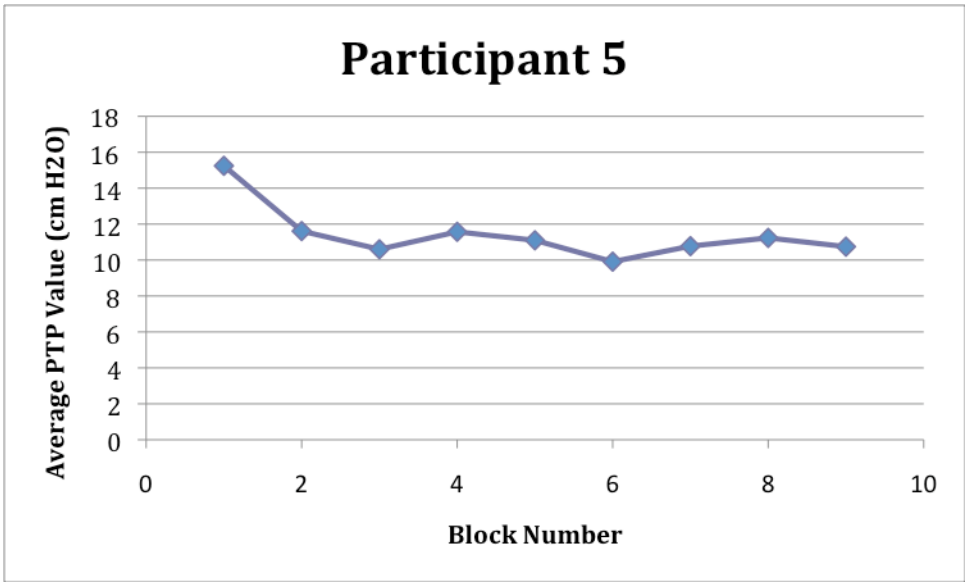
APPENDIX C

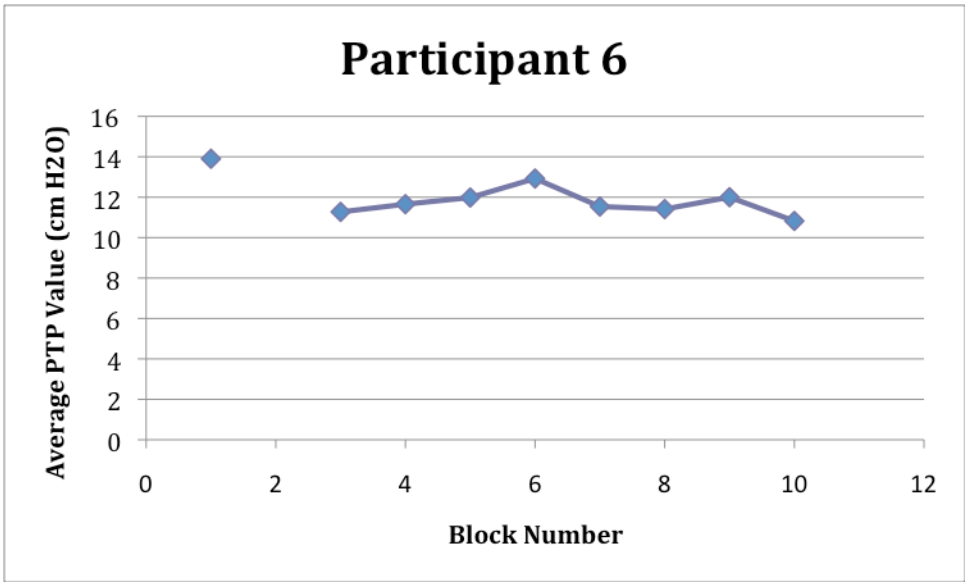

Participant 1
Average PTP Values (cm H2O)
12
10
8
6
4
2
0
0
2
4
6
8
10
12
Block Number

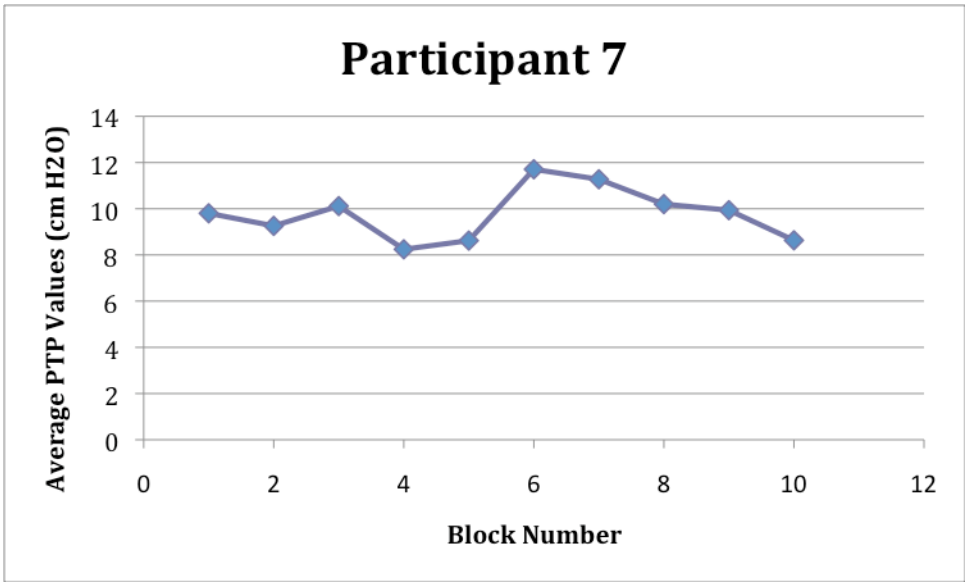

Participant 2
Average PTP Values (cm H2O)
12
10
8
6
4
2
0
0
2
4
6
8
10
12
Block Number

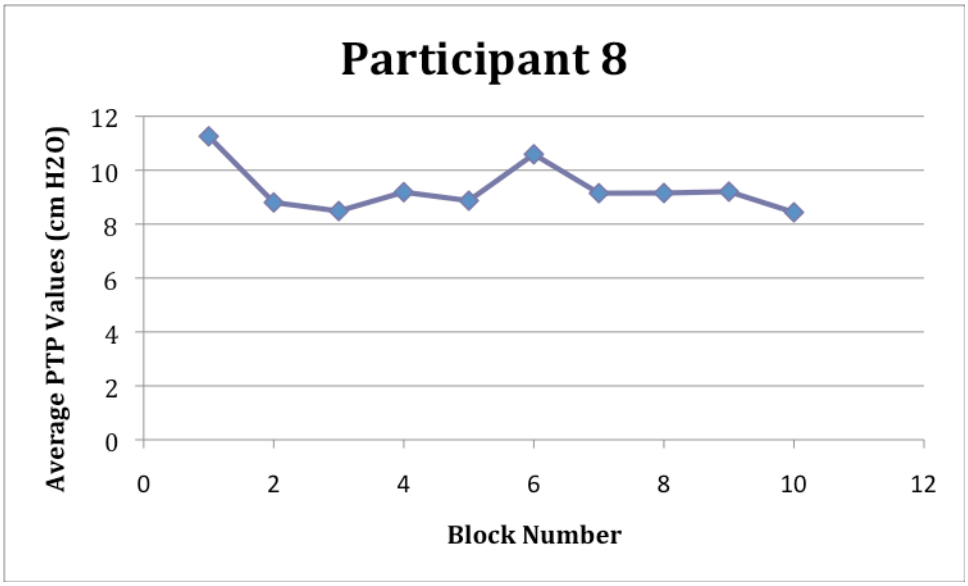

Participant 3
Average PTP Values (cm H2O)
0
1
2
3
4
5
6
7
8
0
2
4
6
8
10
12
Block Number

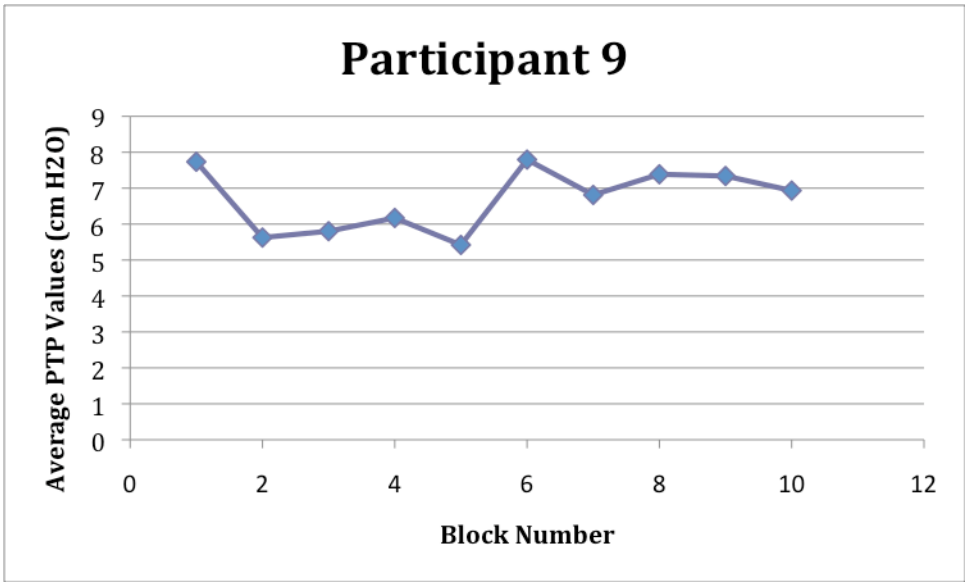

Participant 4
Average PTP Values (cm H2O)
0
2
4
6
8
10
12
0
2
4
6
8
10
12
Block Number

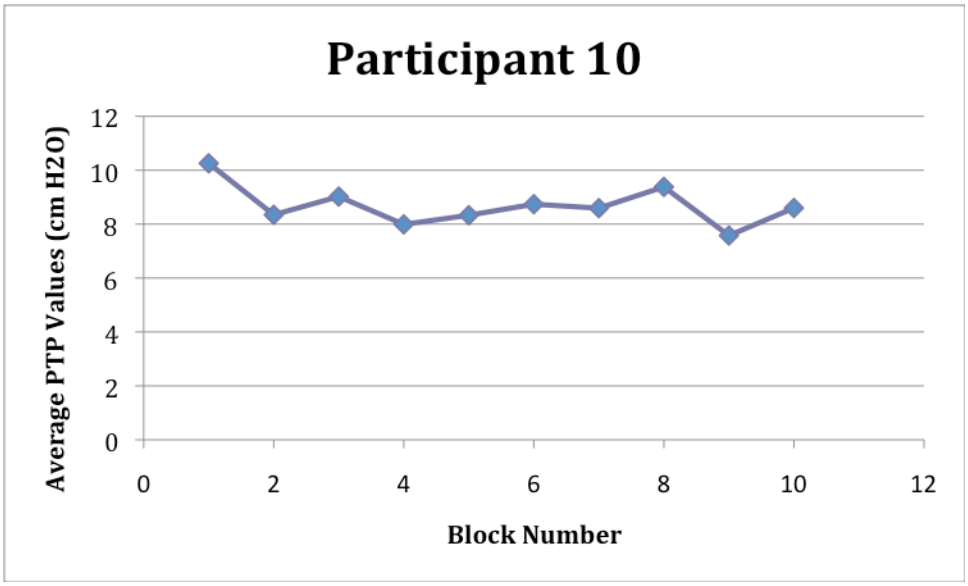

Participant 5
Average PTP Value (cm H2O)
18
16
14
12
10
8
6
4
2
0
0
2
4
6
8
10
Block Number

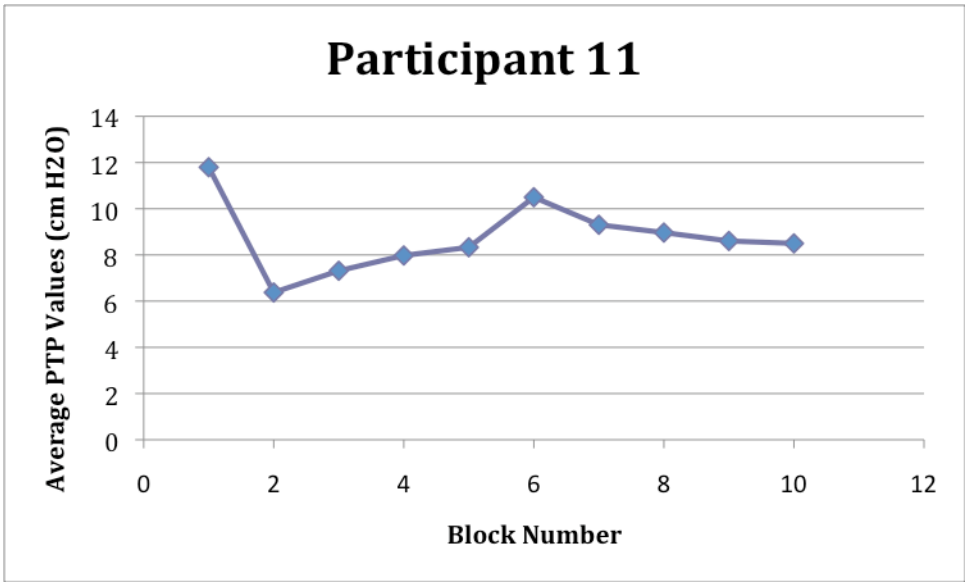

Participant 6
Average PTP Value (cm H2O)
16
14
12
10
8
6
4
2
0
0
2
4
6
8
10
12
Block Number

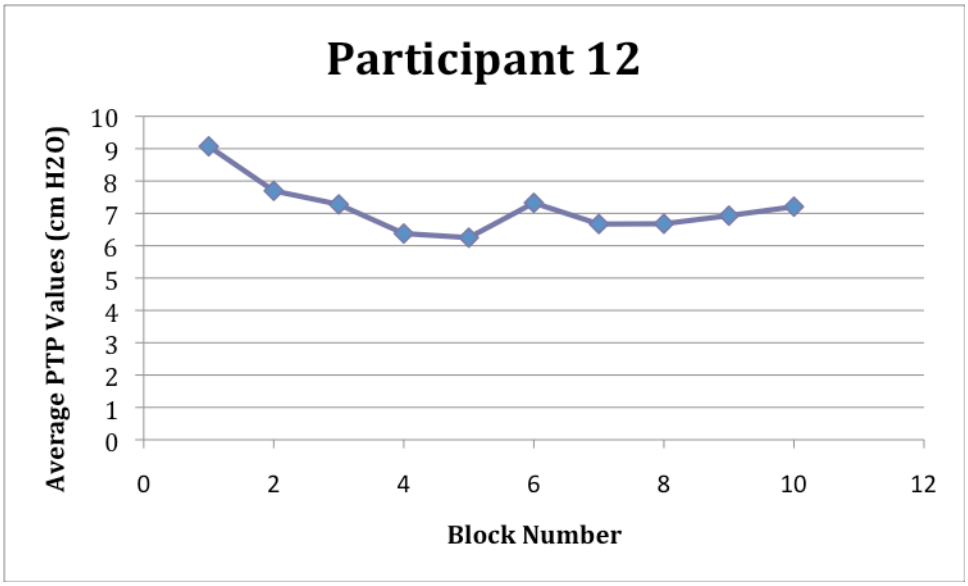

Participant 7
Average PTP Values (cm H2O)
14
12
10
8
6
4
2
0
0
2
4
6
8
10
12
Block Number

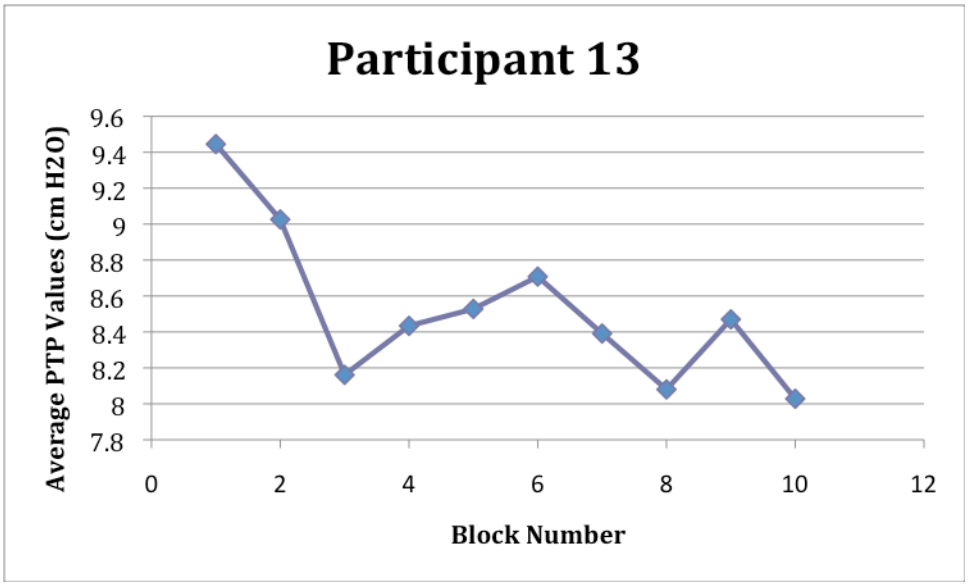

Participant 8
Average PTP Values (cm H2O)
12
10
8
6
4
2
0
0
2
4
6
8
10
12
Block Number

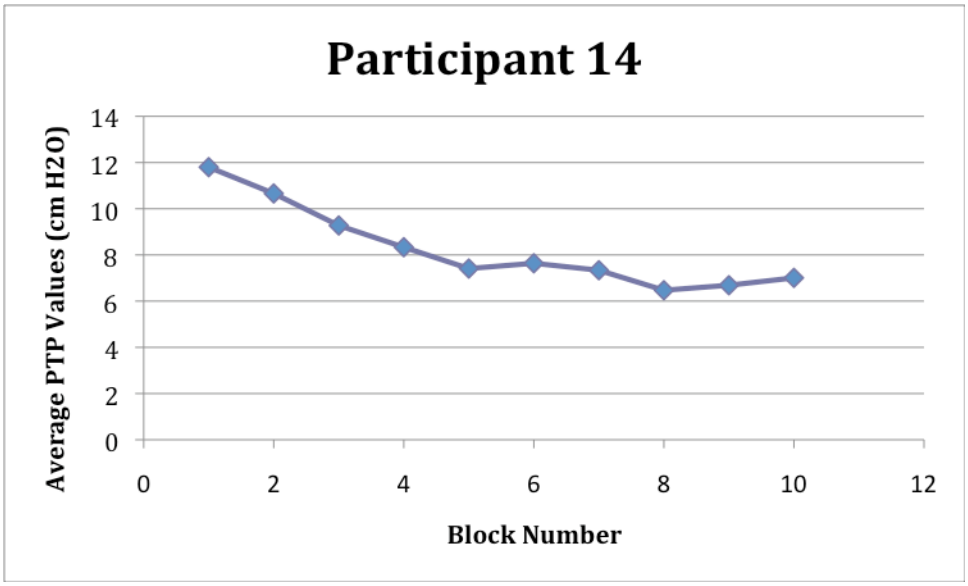

Participant 9
Average PTP Values (cm H2O)
9
8
7
6
5
4
3
2
1
0
0
2
4
6
8
10
12
Block Number

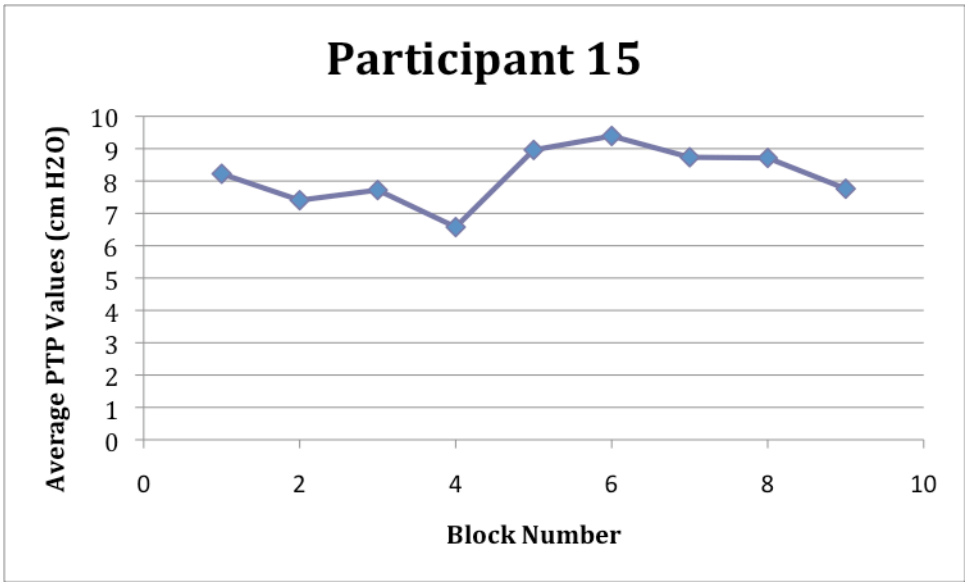

Participant 10
Average PTP Values (cm H2O)
12
10
8
6
4
2
0
0
2
4
6
8
10
12
Block Number

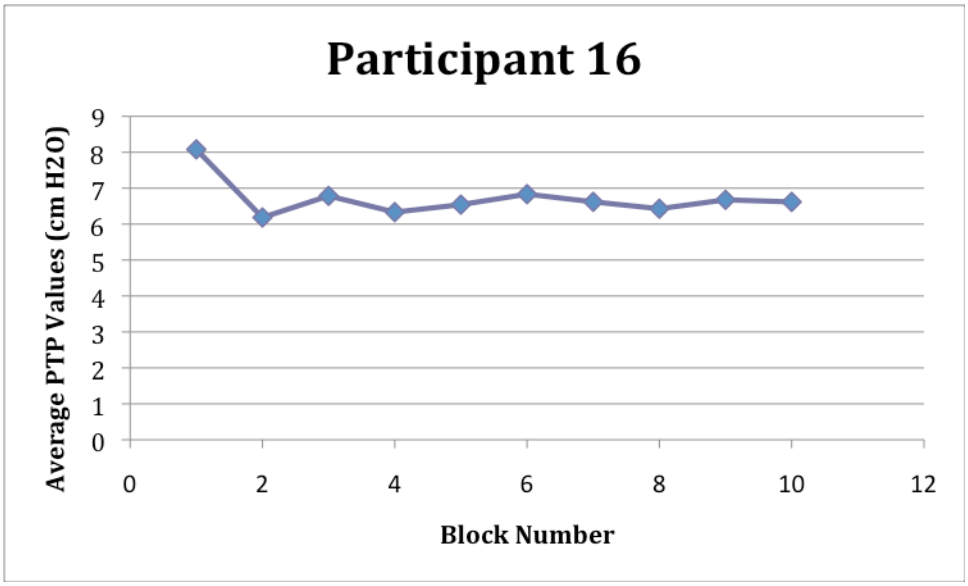

Participant 11
Average PTP Values (cm H2O)
14
12
10
8
6
4
2
0
0
2
4
6
8
10
12
Block Number

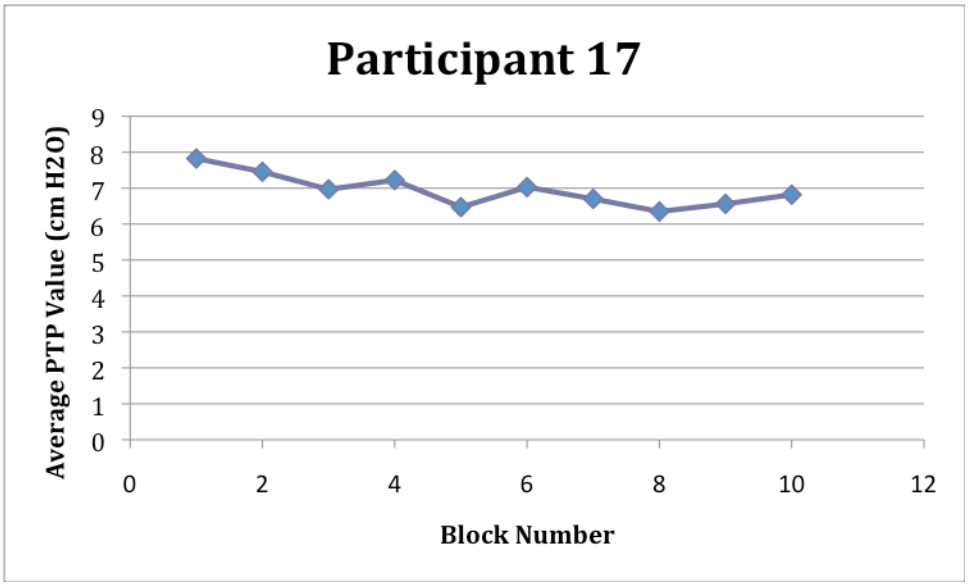

Participant 12
Average PTP Values (cm H2O)
10
9
8
7
6
5
4
3
2
1
0
0
2
4
6
8
10
12
Block Number

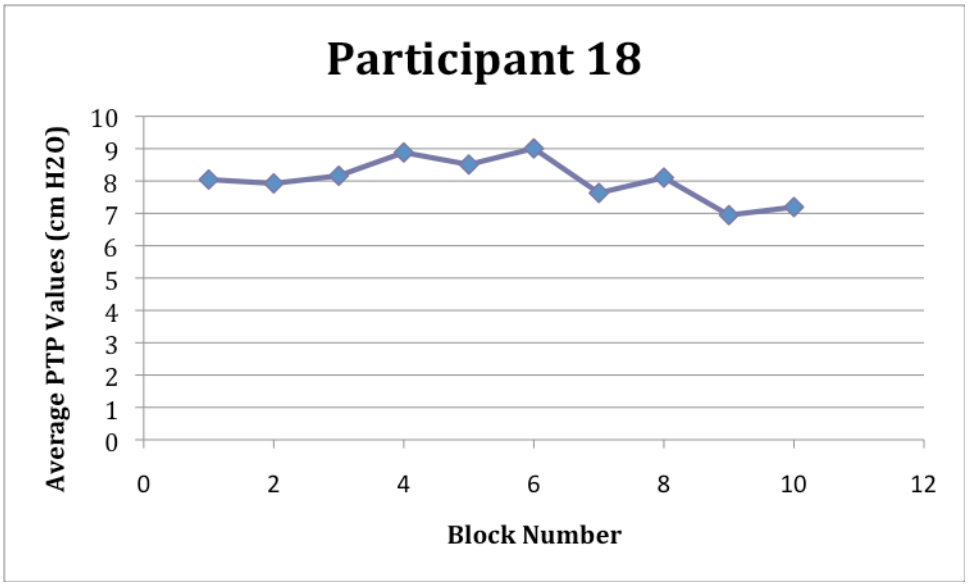

Participant 13
Average PTP Values (cm H2O)
9.6
9.4
9.2
9
8.8
8.6
8.4
8.2
8
7.8
0
2
4
6
8
10
12
Block Number

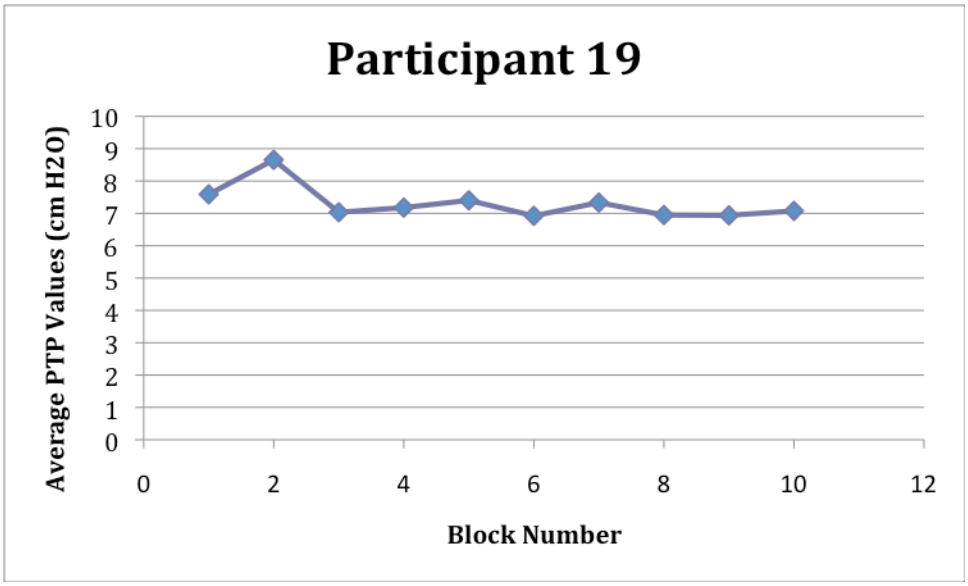

Participant 14
Average PTP Values (cm H2O)
14
12
10
8
6
4
2
0
0
2
4
6
8
10
12
Block Number


Participant 15
Average PTP Values (cm H2O)
10
9
8
7
6
5
4
3
2
1
0
0
2
4
6
8
10
Block Number

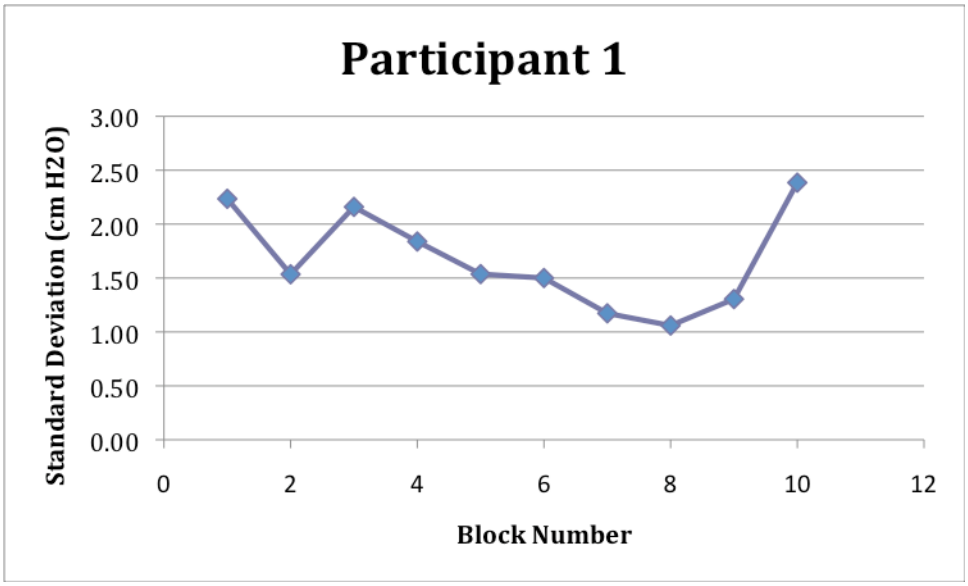

Participant 16
Average PTP Values (cm H2O)
9
8
7
6
5
4
3
2
1
0
0
2
4
6
8
10
12
Block Number

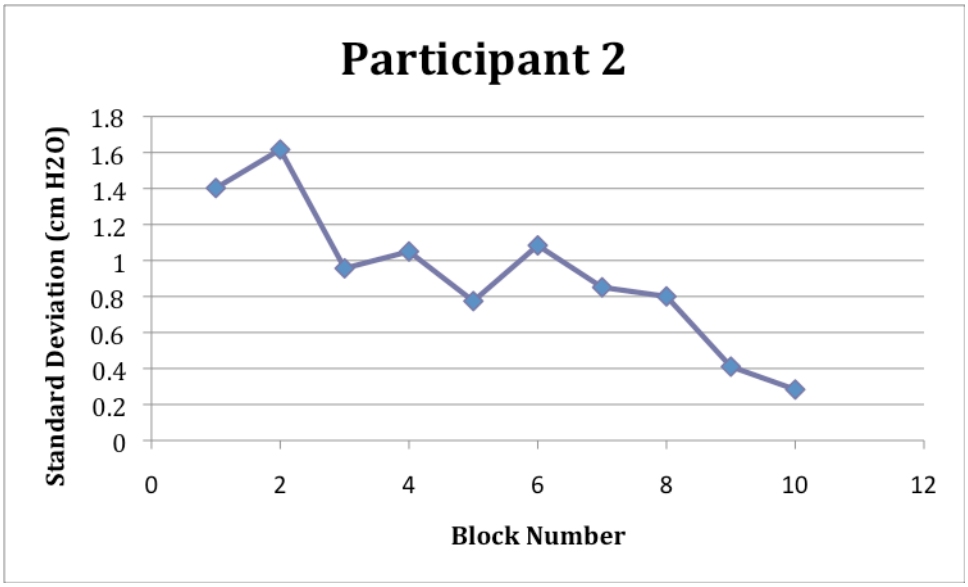

Participant 17
Average PTP Value (cm H2O)
0
1
2
3
4
5
6
7
8
9
0
2
4
6
8
10
12
Block Number

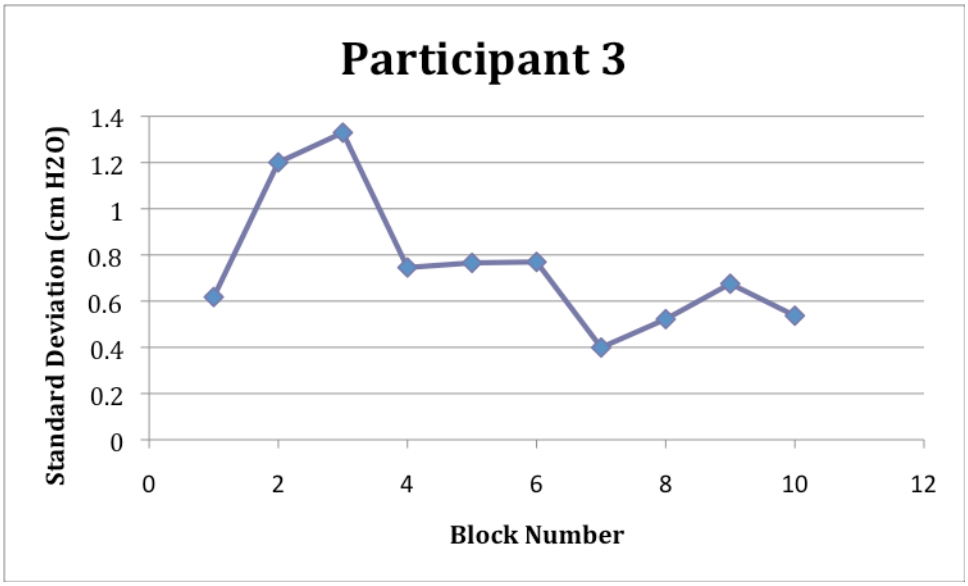

Participant 18
Average PTP Values (cm H2O)
0
1
2
3
4
5
6
7
8
9
10
0
2
4
6
8
10
12
Block Number

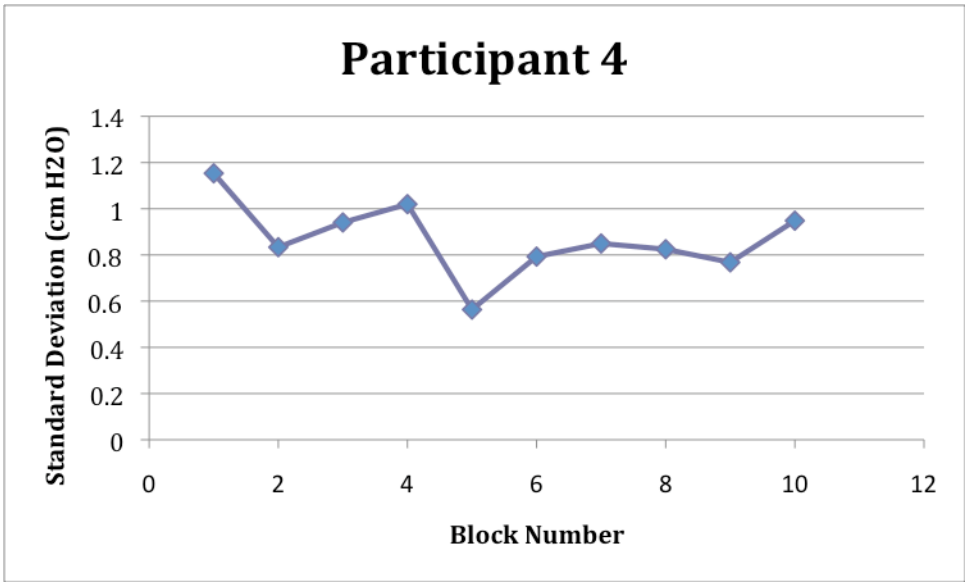

Participant 19
Average PTP Values (cm H2O)
10
9
8
7
6
5
4
3
2
1
0
0
2
4
6
8
10
12
Block Number

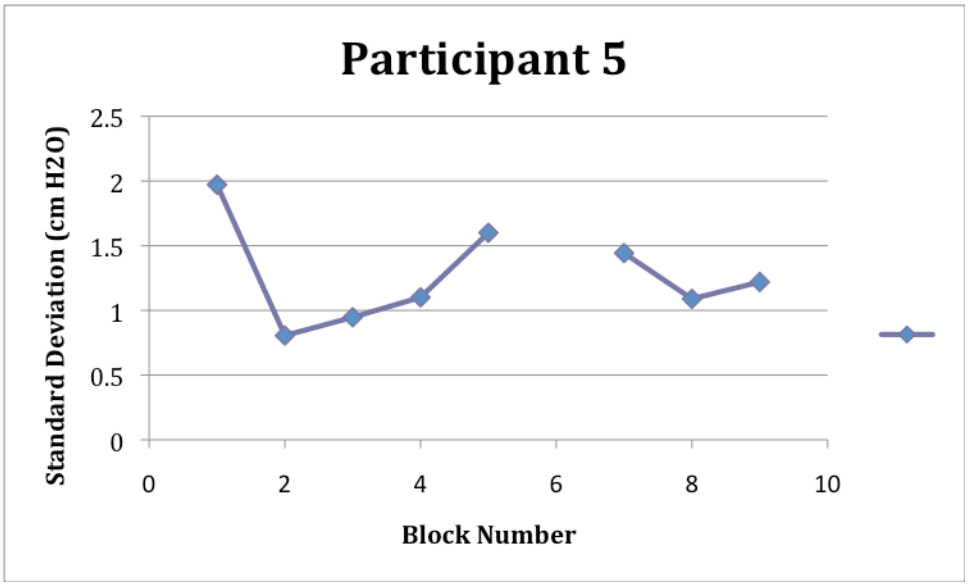
APPENDIX D

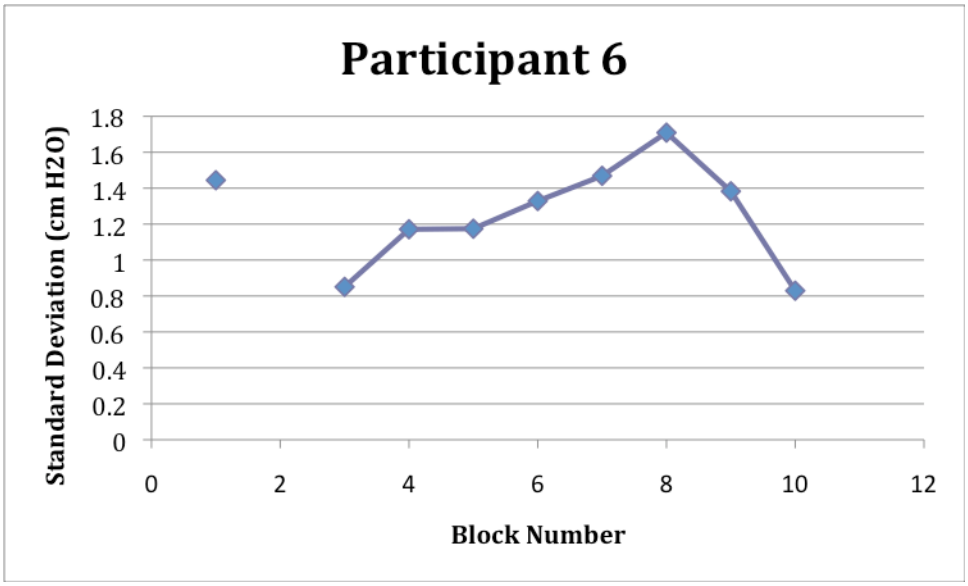

Participant 1
Standard Deviation (cm H2O)
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
2
4
6
8
10
12
Block Number

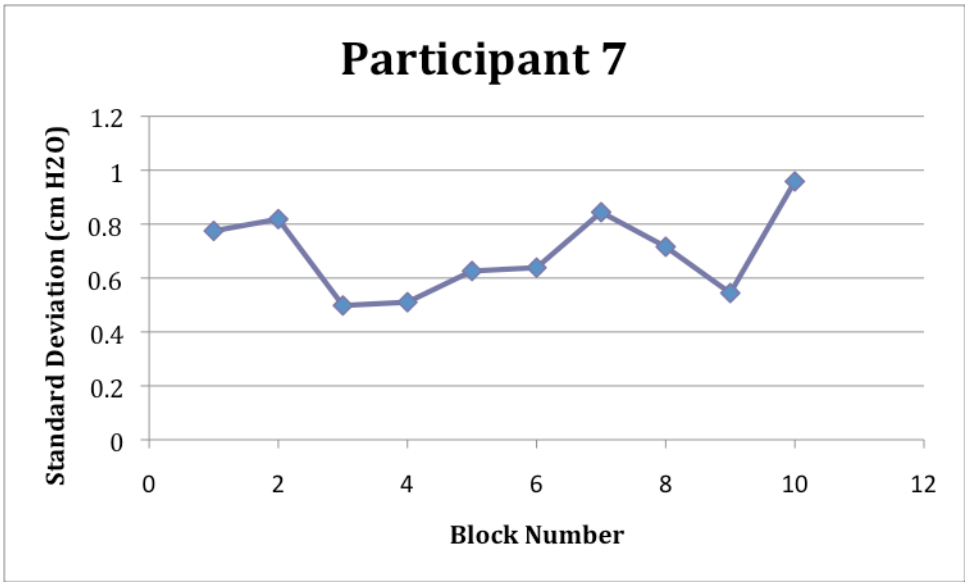

Participant 2
Standard Deviation (cm H2O)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
12
Block Number

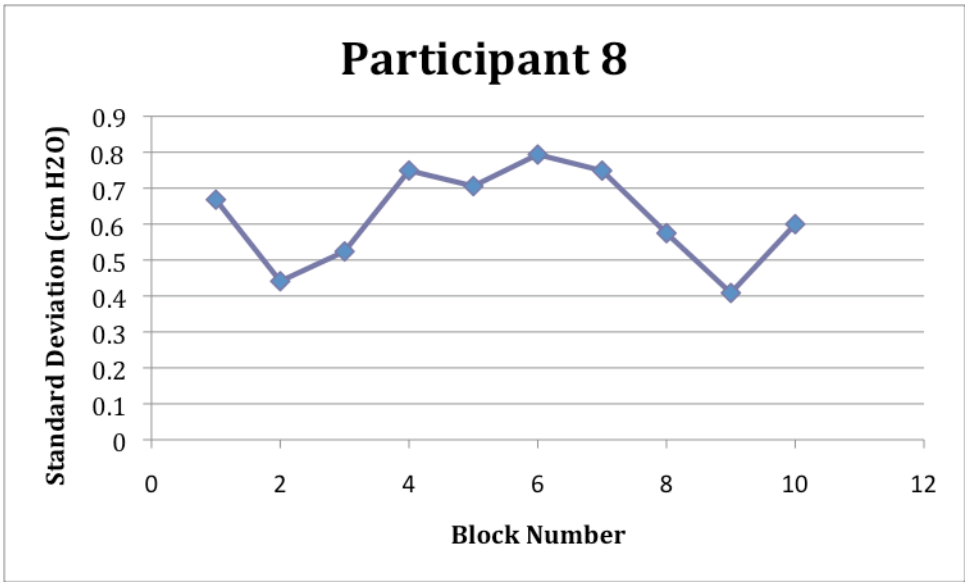

Participant 3
Standard Deviation (cm H2O)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
12
Block Number

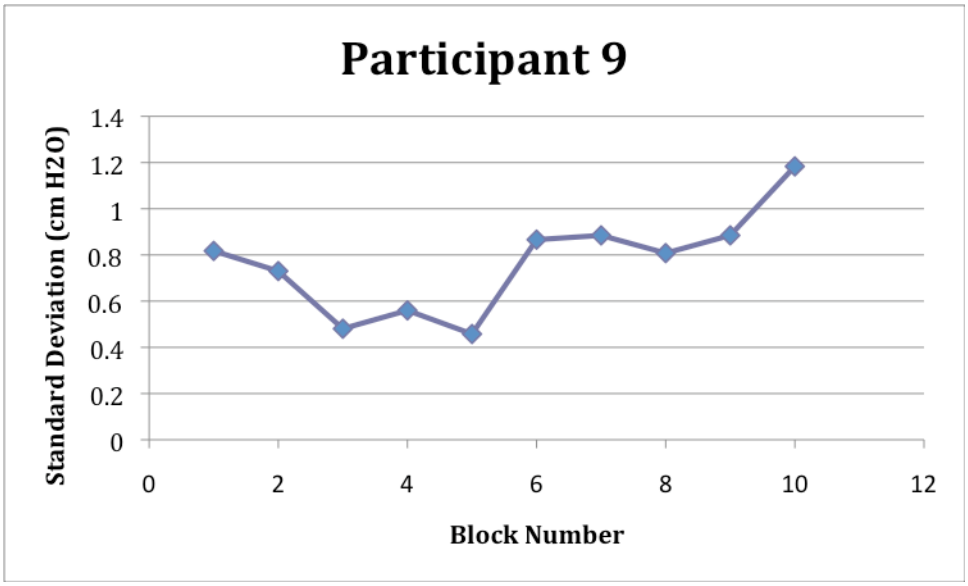

Participant 4
Standard Deviation (cm H2O)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
12
Block Number

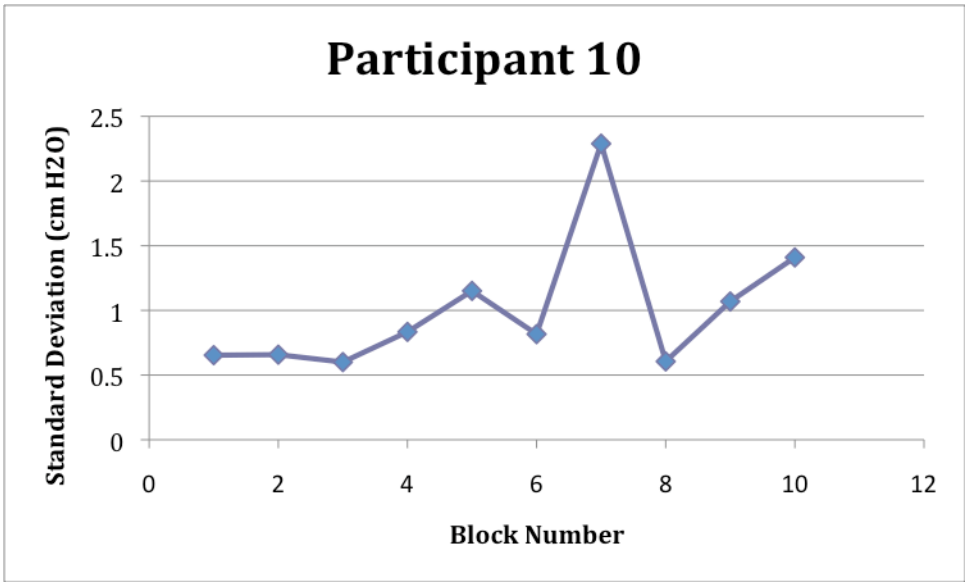

Participant 5
Standard Deviation (cm H2O)
2.5
2
1.5
1
0.5
0
0
2
4
6
8
10
Block Number

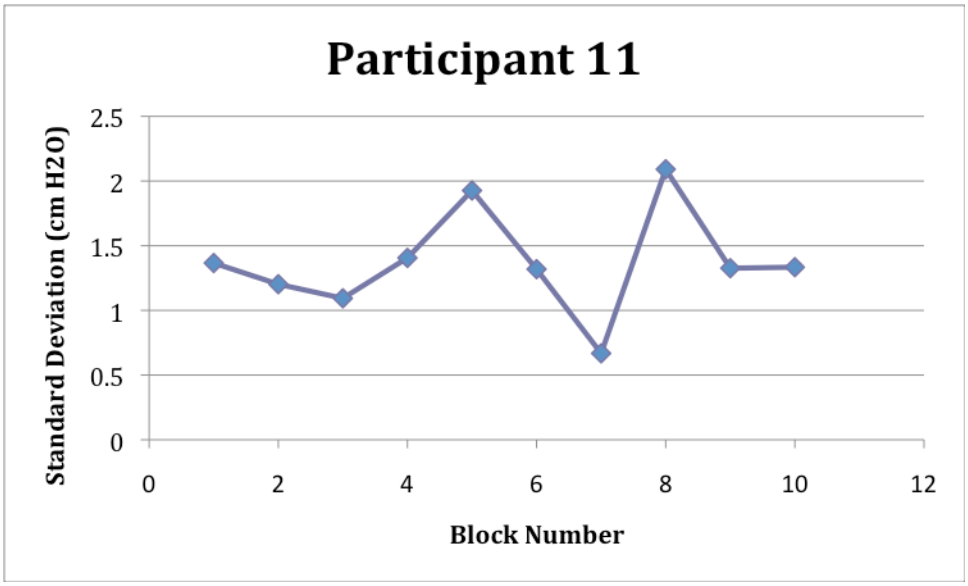

Participant 6
Standard Deviation (cm H2O)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
12
Block Number

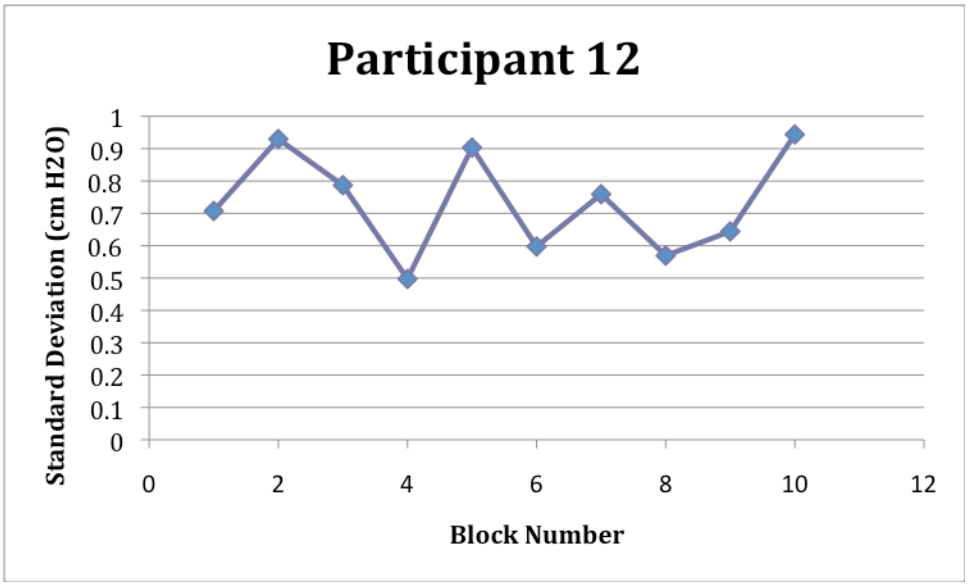

Participant 7
Standard Deviation (cm H2O)
1.2
1
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
12
Block Number

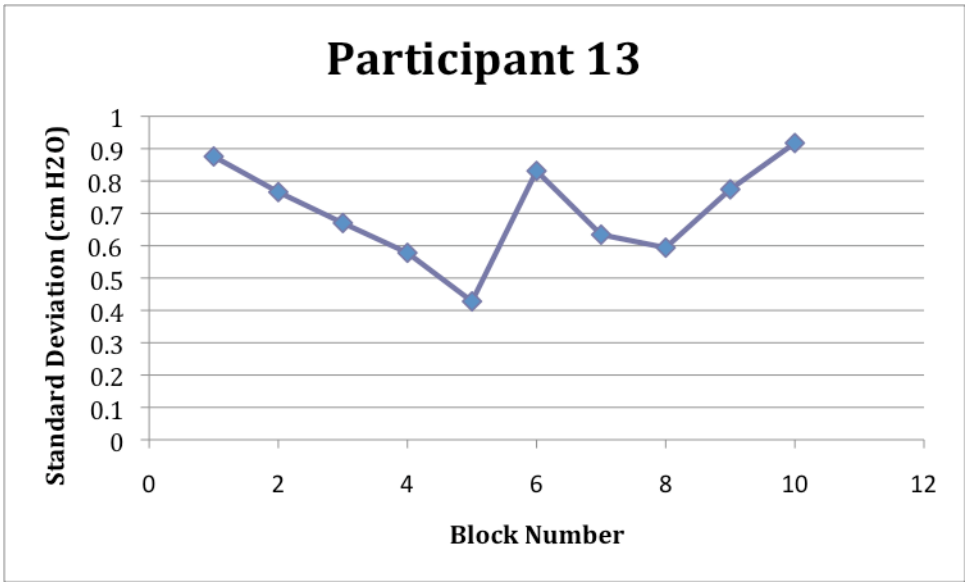

Participant 8
Standard Deviation (cm H2O)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
8
10
12
Block Number

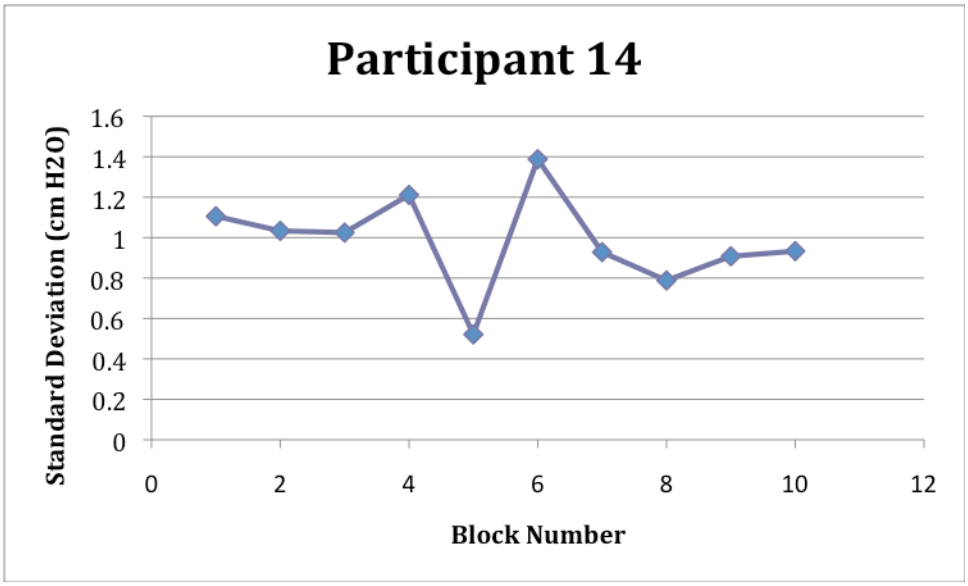

Participant 9
Standard Deviation (cm H2O)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
12
Block Number

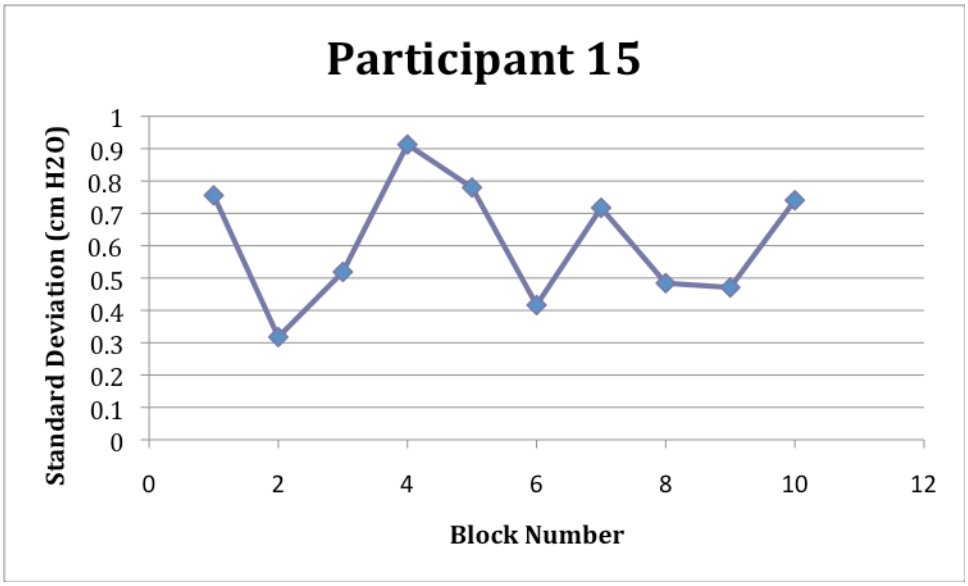

Participant 10
Standard Deviation (cm H2O)
2.5
2
1.5
1
0.5
0
0
2
4
6
8
10
12
Block Number

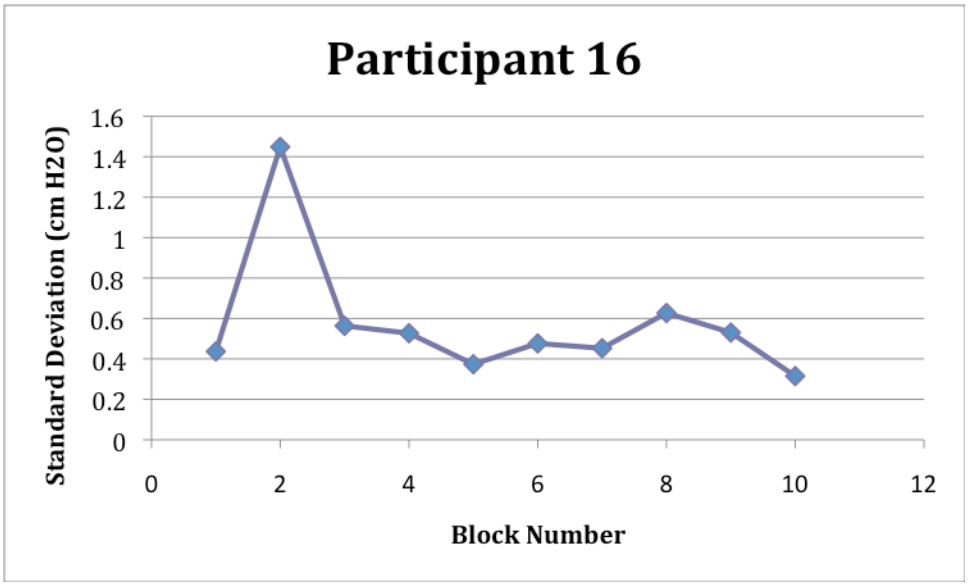

Participant 11
Standard Deviation (cm H2O)
2.5
2
1.5
1
0.5
0
0
2
4
6
8
10
12
Block Number

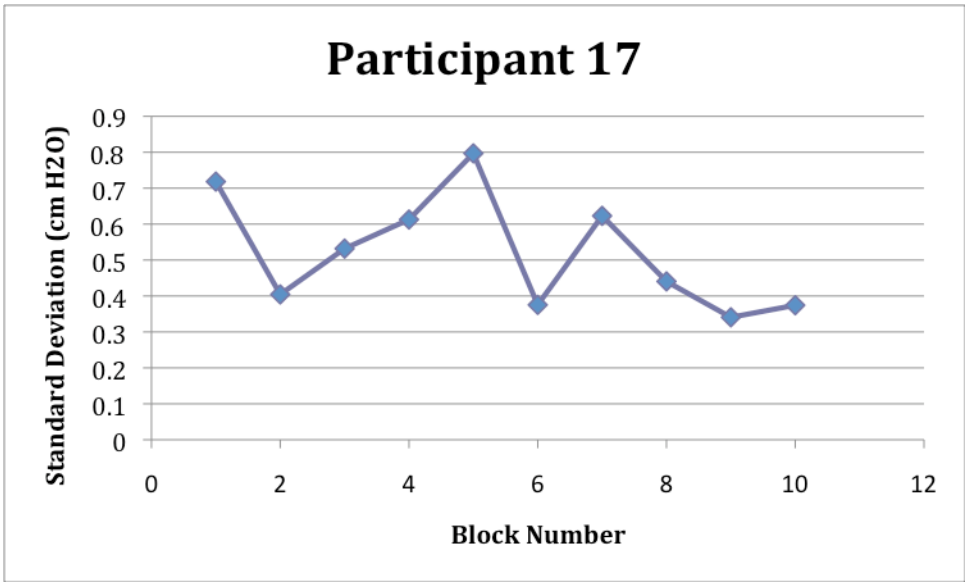

Participant 12
Standard Deviation (cm H2O)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
8
10
12
Block Number

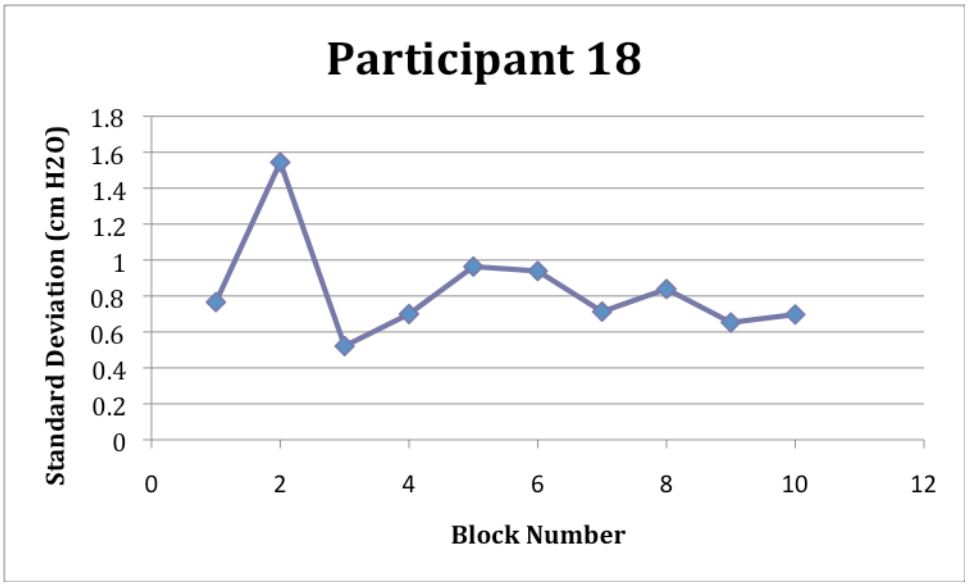

Participant 13
Standard Deviation (cm H2O)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
8
10
12
Block Number

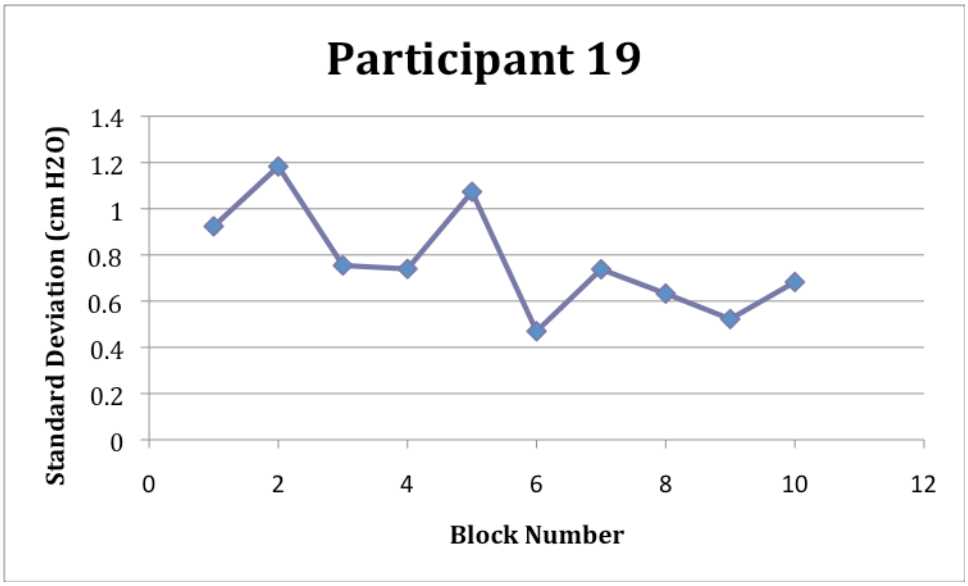

Participant 14
Standard Deviation (cm H2O)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
12
Block Number


Participant 15
Standard Deviation (cm H2O)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
8
10
12
Block Number


Participant 16
Standard Deviation (cm H2O)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
12
Block Number


Participant 17
Standard Deviation (cm H2O)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
2
4
6
8
10
12
Block Number


Participant 18
Standard Deviation (cm H2O)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
12
Block Number


Participant 19
Standard Deviation (cm H2O)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
12
Block Number

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